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ABSTRACT

The theme of the 1993 conference of the North American Association for Environmental Education was "Pathways to Partnerships: Coalitions for Environmental Education." Speakers on environmental issues represented government agencies and legislative houses, international institutions, businesses, and academia and included U.S. Representative Karan English and Madeleine May Kunin, Deputy Secretary of the U.S. Department of Education. The proceedings are divided into five major areas. General session presentations, which include both keynote and featured speakers, include topics on environmental education legislation, reform, and perspectives on the Tennessee River and the Ukraine. Conference workshops include businesses in partnership in education, developing teacher training programs, student assessment, and ecological economics. Symposia cover such topics as wildlife, environmental education advocacy, role of government, adult education, multimedia, sustainable development, and environmental education research. Conference papers were grouped into six related strands: (1) "Educating about Environmental Issues and Policies"; (2) "Curriculum and Teaching Strategies"; (3) "Nonformal Programs"; (4) "International Education Programs"; (5) "From Research To Application in Environmental Education; and (6) "Promoting Environmental Education Programs." Contains a total of 132 conference papers. (PVD)

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PATHWAYS TO PARTNERSHIPS:

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1993 CONFERENCE PROCEEDINGS
BIG SKY, MONTANA

EDITED BY
RICK MRAZEK

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PATHWAYS TO PARTNERSHIPS: COALITIONS FOR ENVIRONMENTAL EDUCATION

Selected Papers from the Twenty-Second
Annual Conference of the
North American Association for
Environmental Education

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Preface

Reflecting on the success of a conference in which one has invested a considerable amount of energy is akin to asking a new father if his baby is pretty. Not only is the answer likely to be affirmative, it often will be expansive, covering each detail from the color of the eyes, to the obvious fact that toes and fingers exist in the right proportions and numbers. I will resist the expansive, but will note that from the feedback and comments, the 1993 North American Association for Environmental Education's 22nd Annual Conference held at Big Sky, Montana, was successful and metaphorically, a very pretty baby.

A key to this success was the conference theme, "Pathways to Partnerships: Coalitions for Environmental Education." The theme described not only what the conference addressed, but accurately indicates how we planned and conducted the event.

Without the partnerships of groups such as the Montana Environmental Education Association, Western Regional Environmental Education Council, and Montana Department of Fish, Wildlife and Parks, the conference would have been less dynamic and more problematic. Excellence characterized the efficiency and skill of the teams that dealt with Program Planning, Local Arrangements, Special Events, and Logistics. Chaired respectively by Bora Simmons, Kurt Cunningham, Judy Driskill, and Ed McCrea, these teams planned effective strategies, coordinated them internally, communicated them externally, and implemented them extremely well. No mean achievement for any conference, their success is even more impressive when one notes that they were "geographically challenged" with offices in DeKalb, Illinois; Helena, Montana; Norris, Tennessee; and Washington, DC.

For the first time, we invited sponsors, and their response was impressive. We achieved a balance of sponsorship between the corporate community and the governmental community. Clorox and WMX Technologies represented their corporations with a high degree of support, honesty and candor. Being the "first" is always risky, and companies that pioneer these efforts are to be admired. The Tennessee Valley Authority and the U.S. Department of Energy represented the governmental sector equally well. Other sponsors contributed to special events, provided support to special guests, and participated in the exhibits. Sponsors of the Big Sky Conference provided a diverse, new element to our annual conference, and set the stage for long term partnerships.

National and international leaders provided keynote messages. We were privileged to hear from Congresswoman Karan English, Deputy Secretary of Education Madeleine May Kunin, U.S. Environmental Protection Agency's Director of Environmental Education Brad Smith, and Ukraine's Environmental Education and Information Center's Head Dr. Andriy O. Demydenko. Their messages and challenges provided insight into today's environmental, political, and economic problems, and reinforced our understandings of the vital role and need for environmental education. Each asked for continuing dialogue with NAAEE and members, an invitation that offers NAAEE an opportunity for continuous input and advice to decision makers at the highest levels.

State and provincial environmental education associations were evident at the Conference. In addition to our Mexican, Canadian, and U.S. Affiliates, guests included representatives from Japan, Hungary, Belgium, Australia, Slovenia, Russia, Brazil, and Africa. As each discussed their international environmental education needs, NAAEE's role as an international prototype was emphasized. Coupled with NAAEE's recent success with the international GreenCOM initiative, the potential for international sharing and partnerships has never been better.

Without question, the quality and quantity of presentations at the conference met the highest expectations. The compilation of these papers and presentations ranks among the most difficult tasks, and the volunteer efforts of Rick Mrazek in leading this effort is admirable. It is no wonder that Rick Mrazek was honored with our Association's highest award, The Walter E. Jeske Award, at the conference. This volume of work evidences this achievement, documents the emerging role of environmental education, and affirms the status of the North American Association for Environmental Education as a national and international leader in this field.

Lynn M. Hodges, Chair
1993 NAAEE Conference

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I. General Session Presentations: Keynote and Featured Speakers

Five general session presentations were made during the conference. Some of these are presented here from transcriptions and others from previously prepared notes, accounting for the difference in presentation format.

Getting Environmental Education Legislation Passed--A Legislator's Perspective

Karan English
U.S. Representative

It is an absolute pleasure to be here today. I never thought I would be standing before this many people who I consider friends in an arena that is so dear to my heart. My staff prepared a wonderful speech which I could read and was way too formal, so I basically have thrown that out, and I would like this to be informal. I'd like, after I give you a kind of a potpourri of thoughts that I have had, to give you an opportunity to ask questions. And I'll be very honest with you about those answers. You may not like some of them, but I think we'll have a better exchange that way. So, if you don't mind not having a formal speech, I'm going to go into Karan's thoughts and share a few things with you.

I think the title of "Building Partnerships" is very relevant today. When I started working on environmental education, it was 1986. That was the first time that I ran for the state legislature and the reason that I started a bill called Environmental Education was because I sat down to thank the person I beat for giving me some good ideas. His name was John Parsons, and he ran for the State Legislature, and he said, "I think we both had very similar causes. We both care deeply about the environment and are concerned about population." I won and he lost. I consider myself to be very fortunate.

So we sat down and had a conversation about how we go about bringing change to what we saw to be some very destructive things happening in Arizona. He said, "I think we need to change the environmental perspective in our constitution and in our State Statutes." I said, "I think that's a great idea." So I started out with a three word bill; three words. It was in less than a paragraph that I suggested that the State legislature include under teaching that when Arizona students learn history, it will include the three words natural and cultural. Just to place that in the statute so that it would open up the doors for all of us to start teaching our children a little more depth of history. There are parts of history that we need to be aware of.

You would have thought that I was proposing nuclear war. It was absolutely incredible. The far right came out, accused me of wanting to teach evolution in school, if you can believe that concept. They could not believe that I would be doing such a dastardly deed. So I thought if three words, are tough, wait until you see what I do next year. I was so angry that those three words, which are awfully fundamental, would bring about such a war. So we put together a partnership. This is where Cary and a lot of other people came into play. I recognized right away that that partnership was going to be difficult and in fact a lot of those partners didn't meet each other for a long time, like almost eight or nine months. We developed a kind of a business coalition, the agricultural coalition, the legislative coalition, the environmental coalition and the administrations coalition. I had all these people working together, the education coalition, too. I can't even remember all the people. There were at least 100 different people working on this concept. We came up with, not three words, but close to thirty pages. Obviously that had to be boiled down.

So the coalition worked together and came up with a plan that really had thirteen parts to it. Because I was a Democrat, and because I was in the minority in the House of Representatives, whatever plan I came up with would be unacceptable unless we had a way to pay for it. You've heard this. No mandates without some money. And for those of you who are educators, that is a very strong incentive. We need money to pursue these changes. So I looked around to see what the potential fund-raising opportunities were. We had a gentlemen from Florida, and right now I can't remember his name, he might even be here at the conference, Bill

Hammond. He came and spoke to one of our little consortiums and told us how successful Florida had been in raising revenue off of a license plate. And so I figured, we aren't going to make a lot of money off of this license plate, the Republicans aren't going to ask me how much money. Let's just throw that out there and let them think that this license plate, this environmental license plate will get everybody involved in coming up with the design. We'll raise enough money to pay for environmental education and we'll put that money right into the Department of Education.

Well, they bought it. In reality, most of the people that supported the legislation had no idea how integrated, how complex and comprehensive it really was. And boy am I glad. If they knew today, right after I left the Senate, there was an attempt to get rid of the environmental education, but they didn't realize we had worked it into so many different arenas, that it would take a lot to get it out of the government and philosophical attitude of Arizona. So it is in place. One of the people who worked so hard on the package in bringing this environmental education together, brought a license plate, and I just want to share it with you today. It is kind of like, for the women, like having a baby, only it's been about four years and we finally had delivery and boy am I proud of what's happening in Arizona.

But this is the license plate, which they're trying to remove right now, the anti-environmentalists. It has raised to date about $180,000 for people who wanted to buy the license plate knowing that it went to environmental education. I am so proud of this. And let me say, I am proud for about 2 or 3 hundred people that made this happen over the last several years. So please don't take it as me having done it by myself.

But let me tell you what's happened through the process. After I left the Senate, where being Chairman of the Environment Committee, I had a lot of political leverage. People don't necessarily like you, but they sure respect your leverage. So I would leverage different things for the environment. And a lot of folks didn't really like it, and I thought it was pretty big stuff until I went to Congress. Let me tell you about the leverage in Congress. Although I'm not Chairman of a Committee now, I am at the bottom and the leverage looks a lot different at the bottom than it does at the top. I'm the one begging now. Anyway, there are some significant changes that have taken place. And I am very, very concerned. I don't think that the partnerships that you are talking about will ever be built in Congress. I don't think that they will be built because of people like me who have become cynical. Because I don't like my opposition. And it will be very hard for me to sit down with my opposition. I know I am targeted by these people. They have put lots of money into getting me out of office. I don't want to sit down with them because I don't like them. So it's going to be left up to people like you who still want to get something done and can still build those coalitions. And you have to do it. And I will tell you that it will be extremely difficult, because the opposition is doing the same thing. The difference here is that you don't want to be calling it the opposition. Let me call it the opposition, they are out there.

I'm going to give you some statistics of anti-environmental groups who would very much like to see you not succeed and who you are going to have to say, "We need to sit down with these people," "We need to build partnerships," "We need to talk about common goals." And the folks that are out there who would like to see environmental education go away, who would like to have private takings, I don't know if any of you are familiar with the legislation that is being proposed now, but there are several bills. Arizona even voted in a piece of legislation that really takes the public trust lands and the direction for public trust out of the hands of agencies and puts it into the hands of corporations.

There is a massive movement. There is a group called, People for the West. I don't know how many of you have heard of that. The anti-BTU people who campaigned vigorously against the budget because they were opposed to BTU are out there. These are anti-environmental groups whose main focus is not jobs, is not protecting the environment, but it is corporation success. And I call part of that corporation success, greed, and bad neighbors. There are a lot of problems with them that you as a grass-roots organization have to identify and have to counter. Now the People for the West, which is a little more of an organization in Western States, has become very successful. They are mainly funded by mining, and by other large corporations. And they have become a grass-roots, public lands coalition. Who would debate something that friendly sounding? People for the West? All of us are for the West, all of us are People... I mean that is such a wholesome, wrap yourself in the flag type of name. Who would even be opposed to it? Well the fact of the matter is they are funded by people who I think have a misleading focus and don't care about what we care about--and that's our natural resources, our future and our children's future.

So we need to identify these people. Let me give you some information about People for the West. People for the West are a grass-roots Western States Public Lands Coalition. They are backed by mining, ranching, timber and other interests who operate on public lands. Over 70% of the People for the West budget comes from those corporate dollars. I, fortunately or unfortunately, represent all three of those industries. Cary told you a little bit about my district. It is a huge district. We have timber in the north, grazing in the north and central part of the district and mining in the southern part of the district, in fact, 41% of the copper mining in the nation is located in my district. So these people probably don't like me very much. And some of the money that they are raising is spent against people like me. People for the West have 75 chapters across eleven western states, with 20,000 activists. They sponsor anti-environmental rallies, letter writing campaigns, and other public and education events. They recently presented the U.S. Senate with petitions containing half a million signatures urging them to preserve public lands multiple-use laws. This goes back to the private takings legislation we were talking about. They have raised $100 million in donations. Now, what we have to do, is make these people, not our opposition, not our enemy, but to teach and to let them know that some of the information that they may be giving is incorrect and that in fact, we all have some common goals.

Those common goals go back again to our children, our environment, our earth and sustainability and indicator species, I mean, we could go on and on and on and a lot of those people don't even know what those things are. That's part of what environmental education is all about. We're going to be talking to our youth and our youth will be the ones that carry the message in the future. There was a poll that came out, I'm not sure what magazine it was, not too long ago, that asked teens to describe their environmental education. 79% said they needed more environmental education. 20% said they got the right amount and 1% said they got too much. We have to be talking to the right people and that's our teens. And those are the people that will quickly be employed in environmental jobs and will be preparing sustainability and all the things that are important for the future. We have to focus on them and that's what makes environmental education the right tool. Building these partnerships is going to become increasingly more difficult. They are willing to put money into opposing these partnerships. They are willing to destroy what I consider to be a pretty visionary focus and that's like the BTU tax. That had so many good facets to it. It was turned into, through a public relations campaign, at least $150 million went into it nationwide. It was turned into a jobs vs. the environment. Now how can you battle something like that? It is most difficult. And in reality it is jobs today vs. jobs tomorrow.

We have to turn that back around. We can't let the premise or the foundation be that it is jobs vs. the environment. And they are ahead of us. They have a captive audience because the people that fund these types of concepts have employees who in their pay stubs can send little notes. I'll even tell you one. There was a note in the timber industry in Northern Arizona, who blamed me single-handedly for the Spotted Owl. And I was absolutely amazed. I wish I had that much power! But I was blamed for the loss of jobs and the incidence of the Spotted Owl in Northern Arizona.

The fact of the matter is that there is a captive audience of people who fear loss of their jobs, who are willing to believe that it is the loss of their jobs vs. the environment. We have to turn that around. It is the biggest, most serious debate that we will have in a long time. And you know how serious it is when you look at population figures. When you look at projected population figures in the future. When I sat down and tried to put the environmental education bill together, I asked somebody from Citibank, a banking group in Phoenix, to sit down with me. I asked a gentleman from the Chamber of Commerce who represented the big mines. I asked some people from the Universities, the Board of Regents to sit down and discuss it. *And every one of them came up with the jobs vs. the environment argument.* Every one of them came up with the concept that growth is the only way that we will survive. That is such a fundamental principle in this nation. That business has to grow for this nation to survive. There is a lot of truth to that, the problem is business making existence for people possible or our people now, the conduit for the success of our business. Why do we have business anymore? And this brings up all kinds of related arguments like NAFTA, and I know there are people here from Mexico and Canada and a lot of other countries. We have to be looking at the bigger question. A fundamental answer to that bigger question is common knowledge. Unless our children have that common knowledge and understand the debate about the environment, we can't even intelligently discuss how important the environment is. It is so fundamental right now that instead of sinking more money into defense, we should be taking all of that money and making a commitment to education. And that's even hard to do. Thank you.

I even got off my potpourri notes that I have rambled on in no direction. But I'm getting some points across that I think are important. When we talk about educating out youth, we need to be thinking about specific areas, specific disciplines. And while I was doing the environmental education partnership building back in Arizona, I had corporations come to me and say they needed students trained in environmental engineering, environmental sciences, energy policy, students that could read air quality laws, students that understand EPA. We have a lot of businesses that were underprepared for the massive regulation. I'm a little underprepared for the massive regulation myself. I think there is an awful lot of regulation. But what we find ourselves doing, is a kind of focus on regulation here and were going to counter it with some more regulation here so that we have a check on the system. And then there are some more regulations for hearings to further check the system. We have become so regulation minded that you have to hire a series of specialists, not only in business, but in education just to decipher what it is that we are trying to do. We have to simplify in our own minds and figure out what our goals are. And I think one of our goals is to get students trained to have the tools, tools that we don't have. And we are not prepared to solve the problems or come up with the solutions in twenty or thirty years from now, we have to give our students the tools to start coming up with answers for a very serious and a very difficult future.

Now that may sound pretty pessimistic, but I am most optimistic. I have not seen a change in attitude like I have in the last year. Everything from changing the focus of the administration on education, to restructuring government with Vice President Gore. A whole book came out with some very positive steps in the right direction to focusing back on our families and our children. There are a whole number of things that I think are positive steps. One of the positive steps that hasn't yet surfaced, which is vital, absolutely vital is an energy policy. We should be training our children today to be prepared to deal with an international, a world energy policy. Now this seems awfully global, and it is. And it is a massive job. But we should shoot for nothing less than that. It is the key to our future. And those are focuses that we should be telling our children today. K-12 should be hearing these things today so they are curious, they want to come up with solutions and we need to be consistent in our commitment to education so that our children and our grandchildren don't pay the price that we are paying today.

The energy policy I think will do a lot of things. Well, let me ask you this. How many people saw the President's Health Reform speech on Tuesday or Wednesday? Quite a few. Something he did, is I think speaks very clearly to what our focus should be. He didn't talk just about health. He brought up two other areas that have to be brought into the solution of Health Reform. One was gun control. Did you guys hear gun control brought up? I was shocked! The other was taxing the tobacco industry. Now that brings in agriculture, it also brings in incidents of cancer, which health pays for, and we all end up paying for that a little bit. But what he did was bring to a lot of us, an integration of the problem. A comprehensive approach. And that's where it is. Government is so complex today, that you can't just take environmental education and put it into statute and expect it to work, because it is much bigger than that. And that's where the energy policy has to be part of that.

There is nothing, absolutely nothing, that I have come upon in my twelve, thirteen years in government that isn't in one way related to the environment. There is nothing. And in fact, I'm going to tell you a story, I had an opportunity, right after I was elected, to meet with the president. He was putting together his State of the Union Speech and he asked twenty people, three of us were freshman. I'm from that dreaded freshman class of 110 that's going to bring around world change in about two days. And it won't happen quite that quick, I hate to tell you, but we're there. One of the things he did was, they brought three of us from Freshman class, and I was rural and western and a woman. And I admit, I was a token woman. That's all right, I don't mind being token at all. Well we, got the opportunity to sit down with both the President and the Vice President . He said to us, "I want to hear from you about what your constituents are talking about and what you think we need for this country." He was building his speech for the State of the Union. I don't know how many of you saw that. I thought it was pretty damn remarkable and I really like the guy. Anyway, he was building that, and when it came to me, I shared with him not exactly what all of my constituents wanted to share, but something I wanted to share. I figured that I might not have this opportunity anymore, and so I took my five minutes to talk about how we can't solve biological problems with economic solutions. That's our problem. We have to convince everybody, it seems like, that we have biological problems and you can't pay a couple of bucks to fix it.

It is an attitude, it is a deeper problem and that gets back to this whole focus of integration of the problem. When I was doing the environmental education legislation, a lot of teachers and administrators and even University people said to me. "Well, can we satisfy this mandate by maybe in 7th grade having an environmental education class?" I said "No way." "That won't do it." You need an integrated approach that in fact, the environment is part of every discipline and that it should be taught that way. You shouldn't make it a special thing that the ranchers or the timber people or that the miners can poke fun at. It should be so fundamental in our thinking that it needs to be integrated. One of the ladies that worked so hard on that, handed me, I guess the twin in my delivery today, was the package that Dr. Allen worked so hard on. I was just almost in tears to see that it was an integrated approach, it's what we need to have and it is starting to work in Arizona.

It is so integrated that you can't just take out one piece and have it disappear. That's a strategy that you need to keep in mind when you come up to that opposition. Make it so integrated, so grass-roots, so much a part of everything that they can pick out one piece and the program still won't disappear. So remember the big scope. And that goes back to what the President said about health reform and tobacco subsidies and the gun law. Well we should be thinking much bigger than just environmental education.

The big question is how we pay for all this. And this is another down-side, because we are down-sizing government. You sit on the floor of Congress right now and there isn't a bill that comes to Congress that doesn't have some kind of an amendment that cuts it somewhere. With the exception of military, most everything gets cut. Well that's opposite thinking as far as I'm concerned, I think military ought to be one of the first areas cut. But it is sure held harmless and it's time that we start looking at the bigger picture.

Let's get environmental education in the military for God's sakes. I mean there is a lot we can do. If we're going to have it, let's integrate it. And this is the attitude that I want all of you to have. I want you to be excited about this. I want you to see this as an opportunity. If we've got funding problems, come up with a license plate. Who ever thought that this license plate would raise $180,000. I never did. And that's in the first year. I figured if we got $15,000 bucks out of it, the legislature would know it made money and I kept my commitment. It has gone wild.

There are opportunities out there, and this is what I implore you to do--to work together. Don't become cynical like I am, because I am. But still try to work those partnerships. And it has to be done at the grass-roots level. Now what I encourage you to do is go after Congress. You need to tell Congress. You need to tell them exactly what you're learning. I've been looking at some of the sessions you're going to. These are wonderful sessions. Share some of those concepts with your Congressmen. Because they need to know that their constituents are thinking and talking and learning about these things. And we don't hear enough of that in Congress. We need to have as much pressure from the pro-environmental groups as we get from the anti-environmental groups. And I just read to you from a list of signatures that went to the Senate against environmental legislation. You've got to be out there kicking, you've got to be writing letters, having forums, sharing this information with your neighbors and letting Congress know where you stand. It is vital. And we are at a time in our lives, in our governmental lives, that some big decisions are going to be made in the next couple of years. Endangered species, how about the mining law? Mining reform is going to come up in a month. Perhaps in the next month and a half, we'll be voting out one of the biggest environmental packages that this nation has seen since 1872. I mean that is absolutely amazing. You've got to be out there writing letters. Because, you know what? The miners, the mining industry, not the miners themselves, the mining industry put together a little rally for me in Globe, Arizona. I don't know how many of you guys know where Globe is, it's right near one of the big mines, a copper mine, and they had 2,000 people come out, a grass-roots effort, to tell me how bad that mining law was. The CEO from that particular mine came in to see me the week before and said "We're going to have a little rally, and it's put on by People for the West. Of course we're funding that and they're opposed to reform and we want to know how much impact this little rally will have on you."

I said "None, absolutely none." But since that time, there have been lobbyist after lobbyist after organization, Women for Mining, Children for Mining, you name it, everybody for mining is coming in to lobby me. To tell me how good this is. And you know what? This is going to be one of the toughest votes of my life. But the fact of the matter is, they are there lobbying. You guys need to get out there. You guys need to get out there and say "Women for Mining 25 Years from Now", "Children for Mining 25 Years from Now". Let Congress know where you are, get excited about it, get out there and give them hell.

Environmental Education--Education Reform in the U.S. Department of Education

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It is a great opportunity to have this chance to begin a dialogue with you. I do want to leave some time for questions at the end. When politicians, or even former politicians, say dialogue, it usually means the beginning of the speech, and I can't break all my old habits. But it is great to be part of this gathering, because you represent both the history of environmental education and the future of environmental education in this country. I particularly relish the chance to represent both the Clinton administration and Secretary Riley in order to outline for you the broad framework of a strategy that will expand the opportunities for environmental education in this country. I would call it a work-in-progress. We have only begun to explore the parameters of what that might look like. And I have to immediately add a caveat, which you may suspect. And that is, as we develop these strategies, we have to bear in mind that we have limited resources to do so. To succeed, we have to do so in a different way than we have in the past.

This meeting provides a great opportunity to get your feedback. Simply because there are limited resources doesn't mean there has to be paralysis. And that there can't be creativity. And that is exactly what we are in search of.

I also particularly like this field of environmental education, because as you could tell from the introduction, my political life has bridged these two worlds of the environment and of education. Those were my priorities starting as a state legislator some twenty years ago, and continuing as Lieutenant Governor and Governor of the State of Vermont. Now I have the opportunity to create that linkage between environment and education as Deputy Secretary of Education at the Federal level. I feel very fortunate. What I would like to do this afternoon is to explore the subject in general and also share with you some of our existing priorities and new initiatives.

As a general observation, I think this is both a very opportune and necessary time to advance the cause of environmental education in this country and around the world. One might, as an outsider looking at this issue, reach the conclusion that both the environmental movement and education in this country are going through a new stage, and a new scrutiny, and analysis. The old assumptions under which we have worked, in the environmental field and the education field are being challenged in ways that we have not experienced before. We can take some comfort in the fact that both education and the environment are considered good things in society. One is for education, and one is for the environment. One might even go so far to say that one is doing God's work in the ecumenical sense, in being involved in either the field of environment or the field of education. That's why many of us have been engaged in these areas, because we deeply believe in the importance of our mission.

But we also realize that is not enough. It is not enough to be for a good cause. It is not enough to be against bad things and for good things. We have to be very accountable, we have to demonstrate that what we do and how we do it does produce the promised results. Otherwise, we cause further disenchantment and skepticism and even alienation from the very causes that we so deeply espouse.

I think we can see that one of the great challenges facing us is that we have succeeded quite well in creating good programs, both in the field of environmental education in particular and education in general. We have some wonderful schools in this country. We have some outstanding environmental programs in this country, many of which are being show-cased and demonstrated here. But what we have not achieved is universal access to excellence through equity in either of these areas. And we have lots of very sobering evidence to substantiate that.

Combined with that, we are going through a period of great public skepticism about institutions and their capacity to function and produce the desired results that we as a society want. The political system is the most obvious example of that. And we can all take pleasure, even I can now, at poking fun and being critical of the political system, to some extent. But we cannot be complacent, that criticism is isolated to that realm. Schools, even non government organizations--all structures that are formally organized--are under new questioning and new analysis. So our large challenge is to expand from a model isolated, uninteresting, not easy to do, very worthy programs, to figuring out how we can reach every child, every adult with the information, knowledge, and necessary skills in order to function in society as good citizens. And, perhaps in combination with the first, how to restore faith in our institutions in general and prove that they do work, and address our most pressing human needs.

In public education, the criticism is more overt and more dramatic. We see it in such movements as the emergence of the Christian right. We see it in such movements as the strong pull, particularly in California, towards a voucher system. And we see it in the constant information and surveys which we in the U.S. Department of Education put forth which corroborate the public's concern about whether or not we are educating the general populace for the kind of life and the kind of work that they will have to be capable of carrying out in today's society. A recent example of that was the literacy survey that was released about two weeks ago. It is a sobering reality that about 20% of 26,000 people surveyed in this country read at a very low level. The literacy study was divided into five levels of both numerical skills and comprehension skills and about half the population does not read according to the criteria set by this study at a level considered adequate for today's workplace.

I don't want to go into great details about that, but what really is at work here are two trends that are not keeping pace with one another. One is, we do in fact have a better, overall educated population than we did ten and twenty years ago, if you measure programs in terms of length of schooling, high school completion rates, and how many people are taking math and science courses. But, the demand for what an educated person is--the definition of education has out-paced that--so that we really have higher demands on education and the supply cannot keep up with the demand. We also have other statistics that corroborate the conclusion that the public education system, while it has continued to function, while it has models of excellence, is not fulfilling its total mission, which is essential in a democracy, of educating the entire population.

Now if there is one premise undergirding public education, it is that every child can learn and can reach high standards. And if there is one goal of this administration, the U.S. Department of Education, it is to live up to that premise. It sounds very easy, that every child can learn and every child can achieve high standards. But if you look at the results, we obviously have not lived up to that. And in order to do so, we have to make some major changes in both our attitude towards education, the content of education, and our expectations of children, we must carry this beyond rhetoric and translate it into action in the classroom.

Can we reach every child in terms of environmental education? Can we reach disadvantaged children, urban children, children of all races? And can we really live up to the basic assumption, and here I am being a bit presumptuous, is that with appropriate effective environmental education, we will see the benefits of a well informed public with both the knowledge and capacity to make appropriate decisions about the environment. In order to have a well informed public, the word public itself means everybody.

If we are talking about a well-informed public, we are talking not only about a public that has information, but uses that information to act in the civic arena, in the public arena where decisions are made. So the mission of environmental education, if we take it to its end point of enabling adults to make informed decisions, cannot succeed without combining it with a mission of public education in general, which is to educate every child to meet high standards. It also means that we have to begin, and I know many of you are well on the way, so maybe begin is not the right word, but we move beyond being for or against certain issues. We have to ground also environmental education in good science. We must give people the capacity to analyze conflicting information, because as adults, they will certainly not hear only one side. They will continuously hear many, many sides and the skills of analysis, of deciphering, of problem-solving, of distinguishing fact from fiction, all of that will be essential for good environmental citizenship.

On the bright side, I think there is an opportunity to look at these two issues; the need for educational reform in order to reach all children with challenging subject matter in a way that is exciting, and the challenge to make environmental education more widespread is equally challenging. We can look at that as a happy convergence, or a happy confluence of trends, if you will. Because we can look at the possibility of both the environment and education as augmenting and enriching one another as we move forward with education reform.

Environmental education, in fact, is a vehicle for reform. And in turn, the new wave of educational reform is an opportunity to strengthen environmental education. But you realize, as we do, that we always have to keep in mind the real litmus test of a good environmental education curriculum requires it to be challenging, based on good science, devoid of bias, and that it stands up to strict scrutiny and assessment. Of course one can apply those criteria to all education. There are very high stakes in terms of whether or not we succeed in converging these two phenomenon and really emerging as a stronger education system and a stronger environmental education system. Education is still the optimistic side of the equation. That's why we return to it again and again. It has a certain mystery about it. Because a child's mind, even an adult's mind is always open to new ideas, to new experiences and new possibilities. To overcome the schisms that exist in our society between rich and poor, between well educated and not well educated, and those based on race, can only be bridged through the miracle of education. I think the necessity to do that is greater than ever before. We will never have an environmentally literate society or a society, with the common threshold of knowledge that united this country as a nation as it was conceived, without our continued commitment and faith in education.

Now having said that, I realize it is not easy to do, but it can be done. And while we always look at the despairing statistics in education, there actually are some optimistic ones if you know where to look. Some of the areas have in fact improved. For example, African-American students are taking about 200% more pre-college courses in high-school, including math and science than they did some 15 or 20 years ago. And the gap between African-American students and white students, while it is still there, while it is still deplorable, is in fact, narrowing. So when we focus, we can create change. When we create high expectations, we can achieve high results. Perhaps the greatest tragedy that we have imposed upon our children is that of low expectations, and we then get the continuous self-fulfilling prophecies of failure. So how do we continue to follow through on high expectations and actually make this work? Well it's the first time in recent memory that the U.S. Dept. of Education, and the President, and the Secretary of Education have in fact become engaged in the environmental education discussion. And I, for one, think that this in itself, while it doesn't do the job, is significant. We are part of a partnership. We intend to remain part of the partnership and make a real contribution.

What are the vehicles to make that contribution? Well there are two legislative vehicles that I think can be helpful. They both will be debated on the floor of the House and the Senate shortly. The first one is an over-arching piece of legislation called Goals 2000, Educate America Act. You are probably familiar with the educational goals. They have been discussed since the Governors met, and I was part of that group. Then Governor Clinton was very much part of that group which President George Bush called together in Virginia where the six education goals first became articulated.

This legislation puts them into law and puts into place the policy I stated earlier that every child can achieve high standards. And as part of that high standards discussion, various groups, are in the process of spelling out those standards: what children should know, what children should be able to do in specific subject matters; math, science, geography, English. The arts have been added, languages have been added, civics and others. It is a delicate political task, because there obviously is lots of debate about this question. Should the federal government be involved in this at all? Are we creating a national curriculum? Is this imposing something on localities? And on the other side of the debate, there are people who say, well, we shouldn't be going so timidly into this area. We should actually have a national curriculum and national tests. We're saying no to both of those and saying this is a model that is voluntary that you may or may not use. You can use these national standards, they are guideposts. If you do you may be certified as having achieved the national standards, but they are not compulsory.

We are also saying, just going piecemeal, just going totally decentralized and laissez-faire, has not given this country the kind of competitive level of education that we need to have in order to be foremost, not only in terms of economic growth, but also in order to be a unified society. The kind of disparity we see in educational achievement around this country is unacceptable if we are to have a common threshold of knowledge that is available to every citizen. So it is an interesting challenge and Goals 2000 will be hotly debated, but I think it is a very significant step for this country to say: yes, we are going to focus on content.

We've always expected miracle solutions from methods of teaching and new fads. And we still have to improve our methods of teaching, there is no question. But we also have to realize, if you don't have the basic facts, if children don't have the basic knowledge, no miraculous technology, no miraculous teaching method is suddenly going to transform children into well educated adults. We as a country have never faced that reality before--that you have to know something to be an educated person. It seems fairly fundamental.

Another area where we are introducing legislation, is the Elementary and Secondary Education Act. That is where the dollars are in elementary and secondary education, $10 billion. Part of that act is Chapter One, those of you who are in the elementary field are familiar with it, and Chapter One has some $6.2 billion. Chapter One is an interesting example of how you can be for a good thing and still not do good. Chapter One is an outgrowth of the Poverty Program, some of us are old enough to remember that, the old war on poverty. And it is targeted towards a term I don't particularly like, but we don't have a substitute, disadvantaged children. A recent analysis of Chapter One has shown that the children involved in Chapter One don't do significantly better, by and large, than the children not involved in Chapter One. So here you have $6.2 billion that we may or may not be spending well.

Under this new authorization, we are doing a number of things. We are concentrating the funds towards the poorest districts, because under the present funding many poor students don't actually get funding because of the quirks of the system. And it is spread so thin, 93% of the school districts in this country get Chapter One monies. We are saying they should go toward the poorest of the poor, because the learning disparities, the difference between the poor children and the middle income children start in pre-school and get astoundingly wide and the poor children in poor school districts do worst of all. So this is an effort to target and use those funds for total school reform--doing interesting, exciting things, having challenging subject matter and using innovative methods of teaching. Don't just pull out kids for fifteen minutes a day and tutor them in reading, because that will not improve those children's learning ability.

It is another tool of educational reform. It also is a tool of teacher development. And that is where the environmental education movement can find an entry point, in ESEA. We are recommending to the Congress to combine the math and science Eisenhower Program and Chapter Two and using all of it for teacher development. And teacher development obviously is a large area of the environmental education mission. We are also saying we will be much more flexible. We are open to waivers, we will have fewer categorical programs, and basically, the bottom line is we want to be able to respond to community school needs, instead of having you try to figure out where you could fit in to this very complex grid of Federal Programs.

In addition to Goals 2000 and the Elementary and Secondary Education Act, the Department of Education is getting very much more engaged in the whole issue of technology. While technology in education is not the entire answer, it is a very exciting component, which again, we have wonderful models around the country, but we do not have equity. The poorest districts have the hardest time gaining access to the wonderful opportunities that are there in the use of technology in teaching. We have brought aboard a woman named Linda Roberts who is an expert in this area. In fact, she was considered one of the ten educators of the decade by a technology magazine, and I'm very excited to have her working in my office. Now the whole question of how we reach out, how we reach out beyond the confines of the pilot program and reach all children in America, can partly be addressed through technology.

Another initiative has existed in the federal government, but is being brought to a higher level, is collaboration within the government itself. And that can also lead to collaboration at the local level. We have an entity called FCCSET (pronounced Fix-it), which some of you may have heard of. Probably it is not a household word. It is the Federal Coordinating Council on Science, Engineering and Technology. And the whole point of it is to coordinate programs so that the public can get better results. I have agreed to co-chair the FCCSET on education and training and have established an ad hoc working group on environmental education and training, where all of the major players in the Federal Bureaucracy are represented. And we're off to a very good start. Ronn Hunt, who many of you may have met, is here with me today, and Mike Baker from EPA, are both taking strong leadership roles on that ad hoc committee. The group has met several times and is analyzing the possibility of a comprehensive inventory of programs and activities within the Federal government related to environmental education.

So we hope we can be more user-friendly, less complicated and more practical. And this will give us a good opportunity to find out what's missing: not only what we have, but what we don't have and what is being duplicated.

Another avenue for action on environmental education from the Federal level is through the President's Council on Sustainable Development, and I've recently been appointed an ex-officio member of that council along with Senator Tim Wirth. It is being co-chaired by my former Vermont Environmental Secretary Jonathan Lash, and the committee is seeking input on how we can undertake the challenging task of educating both children and adults about sustainable development. And obviously taking it beyond the words, but really fleshing it out; how do we get examples of sustainable development that work? We all believe in it, it has at first blush seemed to solve all our problems, but in reality, it is not easy to do. And we need more examples of how we educate Americans for that. Certainly that is a big challenge, and I will be meeting with a group this afternoon at 3:00 pm to seek some input. We will have a separate task force on the education part of this Commission on Sustainable Development. And any of you who wish to join that, please do.

Well what do we make of all this? How do we take the next step, go to the next threshold of recognizing that we've got to be accountable? We've got to be able to spread the message beyond the few, if we are going to have a society in which people are literate in every sense of the word. Literate in good citizenship, literate in environmental decision making, and literate in their sense of social responsibility. I think one thing is clear, none of us can do it single-handedly, the Federal Government can't do it alone. But by opening the doors of the Federal Government, by establishing the dialogue, we can begin to give the theme of this conference "Pathways to Partnership" real meaning. Sometimes you say "Partnership" when you run out of money, sometimes you say "Partnership" when you run out of ideas, or sometimes you say "Partnership" when you don't want to take the heat. But I think if we are to give partnership its positive meaning, it means that you can create more ideas, more courage, more involvement, more impact when we all hold hands in this effort.

What we can do at the Federal Level, in addition to all of the specifics I outlined, is use the great and awesome power of the bully pulpit, which is not to be underestimated. There are times when words are simply words, and people get tired of the rhetoric and they say this is another promise unfulfilled. But there are times when the words are re-enforcing what has to be done at the local level. At the meeting I left before coming here, a group of us met to explore the possibility of converting the Presidio Military Base into an environmental education center and we would like to have some of your input on that too. One of the teachers who was there said, "I'm so glad you are saying what you are saying so I can take it back home." And if the federal government is saying that the environment is important, if the Federal Government is saying that education is important, and if we put those two words together, that does strengthen your hand when you go to your school boards, when you go to your principals, or when you go to whatever powers that be that also make those decisions. So that is a way the partnership spirit can work as well. If we are all espousing a similar theme, about the future direction of this country, that is the only way change eventually takes place, and that people, one-by-one, in their separate jurisdictions make things happen in small ways that lead to large differences.

Let me close by mentioning two things. One is that I would urge you, and I heard, informally, that many of you are thinking this way already, to figure out how to create environmental education standards, so there can be some uniformity, some real assessment on how we pursue the cause of environmental education. I think you are now mature enough, you have enough models of good programs, and you have enough experience to be able to do that. And most people agree, it should be integrated, rather than be a separate curriculum. Since the standards are going forward in education, I think it would be very, very appropriate to put your heads together to figure out how you can shape it into the entire environmental agenda, but so you have an educated person at the end of twelve years of schooling. It can be done, as long as it is done with a plan in mind, with real content in mind, with real challenging material in mind. My caution would be that this will be difficult and will take time. The math teachers of this country have been working on this for seven years, and they have a product that is being used at the present time, that is already being revised.

My advice to you would be to seek lots and lots of input. Don't put five people in a room, lock them up and have them come out two weeks later with environmental education standards. They'll be booed and run out of town. Listen to teachers, listen to the community, listen to business leaders, listen to students, and listen to your toughest critics as you put these standards together so that when they do emerge, you have public support for an environmental agenda. And that is the only way, I think, that it will grow as a movement from being sporadic, being wonderful in some places and non-existent in others, to being a serious, necessary part of the education curriculum for all the children in this country.

I have one final observation, to go with all the tough issues, with all the specifics we have talked about in this workshop, and I'm sure they have been wonderful workshops, and wonderful programs, and I wished I could have attended them. I believe in substance and I believe in specificity. And I believe in the necessity of being a good teacher. You have to know something, you have to be grounded in your subject matter. You can't teach in an exciting and innovative way if you're not confident and enthused yourself about the depth and breadth of your knowledge and the importance of your knowledge. That's where it begins.

I urge you to remember what brought you into this field. It was undoubtedly a passion for education, a strong commitment to the environment, and that these causes are worthy causes. There is a tremendous amount at stake in our capacity to fulfill our promises to our children and to the next generation. This is such a beautiful place, but just driving around this morning, where you see the areas of clear-cutting, and you see the areas of erosion, and you see the areas where a tree is 50 years old and it is only so high, there is still a sense of sadness that we do not yet have a society that always makes the right decisions automatically. We do need eternal vigilance. We do need commitment. We do need more information and more courage so that the next generation will see a different kind of forest.

One Person's Perspective on Environmental Education

Bradley F. Smith
Director, Environmental Education Division
U.S. Environmental Protection Agency

Tonight, I would like to share with you three observations about the state of environmental education in the U.S. While these observations are from only one individual's perspective, they are from a rather unique perspective of an individual responsible for the implementation of the National Environmental Education and Training Act. Let me begin by saying that two of observations lead me to be very optimistic. There is one observation, however, that deeply concerns me. I would like to address that concern first.

Yesterday, Lynn Hodges stated that in a recent poll of fifteen major environmental organizations that environmental education was ranked second in order of importance of concerns. I am sure we would all agree with those findings and I am equally sure that many of us here tonight would rank environmental education as the number one concern. The truth is, however, that environmental education is not a priority policy item.

I was recently told by a policy-maker in Washington that environmental education is good news and therefore not news. I am increasingly concerned that environmental education is being pushed lower and lower on the policy agenda. This is true not only at the federal level, but equally so for the state and local levels. I believe that in order for environmental education to get on the policy radar screen that we must actively push for a stronger political agenda. Environmental education has evolved to the point that it must become more involved in the political process whether it's at the local, state of national level.

The demands for government resources and attention are becoming increasingly competitive. We as environmental educators cannot afford to simply go forward in our respective programs as we have done in the past. Regardless of how important we believe environmental education is to the future if we do not become more active politically, environmental education will be overtaken by other issues.

I am not advocating that you become professional lobbyists or that you spend significant amounts of financial or human resources on political activity. What I am saying is that you add a political dimension to your work. For example, we receive in our office hundreds of letters from members of Congress each year in support of individual grants. These letters are in response to letters written to them from environmental educators asking for support for their proposals. I can tell you that such letters do not influence the grant-making decisions process. On the other hand, we rarely ever get a letter from a member of Congress saying that they have been informed by a grant recipient of being awarded a grant for environmental education. It is important for you as environmental educators to communicate with decision makers at all levels about the positive nature of your work. If you do not inform them of the needs and success stories of what you do, how do you think they will arrive at their decisions when a vote on funding for environmental education programs comes up? I would encourage you to become active in local speaker bureaus in order to get the work out about the role environmental education must play in the future. Do not overlook writing an occasional letter to the editor of some of the more widely read publications or encouraging colleagues to join professional organizations such as NAAEE. These are but a few examples of basic grassroots political activities that I believe you must incorporate into your agenda. I frequently hear environmental educators says that they don't was anything to do with what goes on "inside the beltway" or at their state capital. The reality is that the policies that will impact the future of environmental education come from those places and if you do not help shape the future, who will?

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The environmental education community must not view itself as independent of the political process. The diversity of the environmental community is our strength. While there cannot be one voice for environmental education because of diversity, we must attempt to unite around promoting environmental education in its broadest sense of our respective political leaders.

We must build on what we have in common. We cannot afford to be viewed as fragmented by our detractors. We may not all agree on the definition of sustainable development or environmental literacy, but we should agree that the children we all work with are our future.

My last two points will be more on a positive note. Over the past several years I witnessed the emergence of two trends in the field of environmental education that I find extremely encouraging. The first trend is that of the growing level of involvement of the corporate community in environmental education. Such involvement would not have been possible only a few years ago, and I am convinced that the field of environmental education has benefitted greatly by our new partnership.

A second trend that is very encouraging is the growing internationalization of environmental education. As citizens of the world we have a lot that we can share with each other. The problems that we deal with do not respect political boundaries. During the past two years, my office at the EPA has met with delegations from over one hundred nations. I can honestly say we have learned more from those visits than our visitors did. We can all accomplish great deeds on our own. However, together we do so much more.

I would like to close by telling you a true story. Because of my job as Director of Environmental Education at the EPA, I often wonder if the work we all do and the message that we all try to send is being heard and understood by the average American. Sometimes it is easy to lose hope and do less than your best. Well, in the late summer of this year, a letter came to our office which not only served to put things in perspective for me, but send a clear signal that we are doing the right thing, and that we just need to work harder and never, never give up hope.

This letter was from the Make-A-Wish Foundation. The letter was from an 11-year old child and what that child said went well beyond the words that are written on this page. The letter stated in part, "I have lymphoma, a type of cancer. My wish is to help save the ozone layer and our environment. Even though I thought I would like a swimming pool, I know that if we don't have an ozone layer or safe air to breath, having a swimming pool wouldn't mean very much. If I could talk to someone in charge of helping to save the environment I could give lectures to schools and tell them what is being done and what they can do to help too. This is very important to me because I'm afraid what the future will be like, if we don't do something about it now. Please help me save the environment."

Here is a child who is faced with a challenge that most of us can only imagine and her "wish" is to educate her peers about the environment. To say the least, she is a powerful inspiration. Please remember that story and if you walk away from this conference with only one thought firmly planted in your mind, I hope it is this: Not only can we make a difference... but we are making a difference... and now is no time to stop.

The Role of Environmental Education in Cleaning up the Tennessee River

Ralph H. Brooks
Vice President, Water Management
Tennessee Valley Authority
400 West Summit Hill Drive, Knoxville TN 37902

Introduction

TVA is a unique government agency with responsibility for developing the resources of the seven-state region drained by the Tennessee River, the fifth largest river in the United States.

TVA produces power, manages the region's natural resources, promotes economic development, and operates 30 major dams on the Tennessee River for a variety of purposes, including navigation, flood control, hydropower production, water quality, and recreation.

One of TVA's primary goals is to make the Tennessee River the cleanest and most productive commercial river system in the United States by the year 2000. We plan to do this through our Clean Water Initiative, a new program aimed at building partnerships to combine and focus resources on the most critical pollution problems in individual watersheds. This program includes three main parts: water quality monitoring, public communication, and river action teams.

Monitoring

Knowing what is happening in our lakes and streams is the first step toward protecting them. We need to keep tabs on water quality and conditions for aquatic life so we can identify problems and tell whether or not corrective actions are working.

To meet this need, TVA has developed one of the most comprehensive water quality monitoring programs in the Nation. We take over 1600 physical, chemical, and biological measurements each year so that we can tell whether the water is safe for human contact, if the fish are safe to eat, and whether the lakes are healthy from an ecological standpoint.

In addition, we share data with the Valley states, and we are expanding our citizen water quality monitoring program. Citizen monitoring can provide information on small streams and lakes that we are unable to monitor, plus it gets people involved in caring for their local water resources.

We've also developed a Teacher/Student Water Quality Monitoring Network. The primary goal of this program is to supplement our water quality data, but it also helps to get water quality concepts into the Valley's secondary school curricula and teachers, students, parents, and their communities involved in water quality improvement.

This program is different from other water quality monitoring programs because we do more than train teachers and students to collect data. We teach them to develop a study question, to select the appropriate measurements to answer the question, and to collect and interpret the data. Each teacher/student team prepares a research paper on their study, and TVA publishes all the papers in a yearbook which is shared with other researchers.

We also emphasize problem solving in working with teachers and students, and several of our monitoring teams have made real differences in their communities by suggesting solutions to the water quality problems they identify.

Public Communication

We have identified public communication as a critical success factor in achieving our river cleanup goal. There often is a big difference between how people perceive a problem and the reality of the problem. Sometimes people overreact when the condition of the resource actually supports its designated uses. And sometimes they do not react at all when there really is a serious problem. What TVA is trying to do, through our public communication effort, is bring public perceptions about water quality and actual resource conditions closer together.

We are working to meet this objective in a lot of different ways. For example, we've developed a new annual publication called RiverPulse. RiverPulse takes the technical data from our monitoring program and presents it to the public in a colorful format that is easy to read and understand. It answers the questions that river system users care about most: Where is it safe to swim? Can I eat the fish? Are conditions adequate for aquatic life? RiverPulse is important because it draws public attention to water quality problems and gives people a way to track progress toward meeting cleanup goals.

Another way we provide information to lake users is through our quarterly newsletter, called TVA River Neighbors. We mail TVA River Neighbors to about 11,000 lake users and distribute copies through marinas and visitor centers at TVA dams. It contains information about our lake operations and land management policies, plus articles on TVA programs to improve water quality, recreation, and other lake benefits.

In addition, working with our Environmental Education staff, we've developed a lot of other publications to promote public awareness of water issues. Our water quality library distributes hundreds of thousands of brochures, fact sheets, and posters to people in the Tennessee Valley and across the country. We also use exhibits, interpretive signs, and slide and video presentations to give people the knowledge and skills they need to help solve complex water quality problems.

Some of the classroom resources we've produced have won considerable acclaim from both the educational community and water resource professionals. I'm especially excited about our newest project, a WaterSource book which TVA is working with EPA and the Alabama Department of Environmental Management to produce. The first unit, for grades 3-5, will be published this fall. It is designed to meet existing curriculum standards, and it specifically focuses on issues that students are likely to face in their lives as they make critical decisions affecting the future of our water resources.

Finally, we promote public involvement by working with lake user groups, by holding public meetings, and by encouraging our water resource specialists to spend time in the field talking with community and business leaders, interest groups, and local citizens.

River Action Teams

TVA doesn't have any regulatory responsibility for clean water. We don't set pollutant limits or enforce standards for discharges. But the public holds us responsible for the health of the lakes in the Tennessee River system. So we need to do more than collect and distribute information about water quality conditions. People expect us to do something about the problems we identify.

Today, many of the problems in the Tennessee Valley come from nonpoint sources--for example, runoff from livestock and agricultural operations, from parking lots and streets in urban areas, and from mining and industrial sources.

These problems are tough to address. We don't have all the money, information, tools, or authority to direct the cleanup, and no one else does either. So our emphasis is on building long-term partnerships to cleanup the Tennessee River section by section.

This is the primary job of our River Action Teams. These teams are made up of water resource experts from different disciplines--aquatic biologists, environmental engineers, planners, and others. They are responsible for developing water quality improvement projects and building coalitions at the local level to carry them out.

We plan to form 12 River Action Teams to cover the entire Tennessee Valley by fiscal year 1996. Three teams already are in place, and another will be formed soon. These teams examine all the available monitoring information, conduct additional field studies to help pinpoint problems and begin identifying their causes, and work with other government agencies, interest groups, community leaders, businesses, and private citizens to develop and implement solutions.

Their principal challenge is to convince all these potential partners that cleaning up the river is worth doing--that it will benefit individual residents and the community both socially and economically.

The key point here is that success depends not just on our technical experts, but on our communication and education specialists. In fact, in many instances, they may lead the process because public education is such a critical factor.

Our new approach also requires focus. We can't tackle all the problems in every watershed. There simply are too many, and some are too expensive or too complicated to address in the near term. So our River Action Teams will focus on those problems where the benefits and probability of success are the greatest. This will help bring our potential partners to the table and, in the process, help bring together the financial and technical resources we need to make a real difference in the health of the river system. Right now, we're helping the river hold its own against increasing development pressures. But, by developing partnerships to tackle high priority problems in individual watersheds, I'm confident that we can accelerate our progress and greatly expand the scale of our improvement efforts.

The biggest challenge is to bring together all of the people and organizations needed to fix individual water quality problems. We need information and education so that, as we work together to protect and improve our environment, we understand each other as well as the problems we face.

Environmental Education in the Ukraine—The Need and the Opportunity

Andriy O. Demydenko
Head, Department of Environmental Education and Information
Ministry for Environmental Protection (MEP) of the Ukraine
John Baldwin
University of Oregon

In February 1992, the U.S. Environmental Protection Agency (EPA) and the Ukrainian Ministry for Environmental Protection (MEP) agreed to establish an Environmental Education and Information Center in Kiev. This decision was confirmed by the "Agreement Between the Government of Ukraine and the Government of the USA on Cooperation in the Field of Environmental Protection" (May, 1992). MEP will provide premises, staff, programs and other resources as appropriate. EPA will provide short-term assistance to MEP, primarily in the form of programs and equipment for the Center.

The initial design of the Center, reflects two principal considerations; the Center is complete in itself if no additional funding becomes available, but it should be capable of expansion should additional funding become available.

In August, 1992, the EPA completed a cooperative agreement with the North American Association for Environmental Education (NAAEE) to provide $100,000 in assistance for the Center.

Founders

The Center is established as institution according to the Ukrainian laws. Founders of the Center are MEP and the University of Kiev Mohyla Academy (KMA). Other co-founders are welcomed. The governing body of the Center is a Council, consisting of representatives of the Center's founders.

Premises

The Center is located in the Kiev Mohyla Academy, in downtown Kiev not far from MEP. This newly reconstituted university, the oldest university in Ukraine (founded in 1615), has reopened its doors in September 1992.

The principal partner of the Center within the Academy, which is non-state university, will be the department of natural sciences (with an emphasis on environment). Ukrainian and English are the languages of instruction in the University of KMA and the working languages of the Center.

Floor space for the Center is about 100 sq. meters in all, with one large room (65 sq. m.) and two smaller rooms. The Center will have access to university facilities, including a large auditorium, conference rooms, and classrooms.

Objectives

The principal objectives of the Center, as defined in an agreement signed by MEP and the University of KMA in October, 1992, are:

- To introduce modern methods of environmental education and information resource management in MEP and the university;
- To satisfy the needs of the government and citizens of Ukraine for current and comprehensive environmental information;
- To cooperate with international data bases on the environment and environmentally sound technologies;
- To develop a broader understanding of the environmental research data and their application.

With all staff and resources managed through contracts, rather than through established governmental structures, the Center is conceived of as a flexible, fast-acting instrument for MEP. It will be especially active in the transfer of international environmental experience to Ukraine.

Forms of Activity

The Center will be open to the public free of charge. Programs may be carried on at various levels, from elementary schools to industry and government officials. MEP also plans to have the Center serve as the focal point of the UNEP Global Resource Information Database (GRID) program.

Projects and Programs

The first programs already started by the Center are directed on the development of Center's facilities. They are the following:

- Completion of Ukrainian environmental databases for the national focal point of UNEP-GRID program (together with Institute of Cybernetics)
- Adaptation of US environmental computer knowledge bases for distribution in Ukraine in soft copies
- Development of the Center's telecommunication facilities (together with computer network GlasNet-Ukraine and in cooperation with UNEP project "Center for Urgent environmental Assistance")
- Implementation of the EPA environmental training modules (together with EPA and Institute for Sustainable Communities)
- Facilitation of the access of Ukrainian schools to the National Geographic Kids Network (together with National Geographic Society)
- Adaptation and publishing in Ukrainian environmental books for children
- Workshops on Sustainable Development for Economics in Transition (March 29-31, 1993) and UNEP Environmental Management Program (October 27-29, 1993)

The following programs are in the stage of planning:

- Decision support systems for environmental decision makers based on GIS technologies
- Survey of possible Ukrainian facilitators and users of the Center's programs and facilities
- Curricula for environmental management courses for natural sciences and economic departments of high schools
- Completion of the Green Library (together with the University of California Berkeley)

The Center will facilitate access of NGOs to environmental information and educational programs. The following forms of work are foreseen:

- adaptation and distribution of environmental educational and information materials in printed, video and computer forms
- access to environmental computer databases in Ukraine and overseas for decision-makers, researchers and students
- collective access to world environmental computer networks (e-mail and teleconferences) for NGOs
- organization of seminars and workshops

EPA will provide programmatic support for the Center, possibly to include the following:

- expertise and training, including EPA's environmental management training modules
- toxic release inventory and community-right-to-know program
- pollution prevention and technology transfer information clearing houses
- computer-based teaching programs, including those using Geographic Information Systems, and other educational and informational software
- lectures and presentations by U.S. environmentalists, scientists, scholars (possibly sponsored in conjunction with USIA)
- publications and library materials

The NAAEE agrees to provide:

- expertise and training
- technical assistance
- ordering and delivering of equipment
- assisting in organizing workshops and exchanges
- publications and library materials

II. CONFERENCE WORKSHOPS

II. Conference Workshops

The NAAEE Sections, the Montana Environmental Education Association, and the Western Regional Environmental Education Council have developed a number of excellent one and two-day workshops for the NAAEE conference. These workshops allowed participants to go in-depth on timely and important topics during the first two days of the conference.

Environmental Education and the Business Community--Building Successful Partnerships

Cherri Briggs, WILD Foundation
Craig Dent, Bureau of Land Management
Dennis Nelson, Western Watercourse and National Project WET
John Paulk, TVA
Al Stenstrup, Wisconsin DNR; and others
Jim Carpenter, TVA

Fifty-five professionals from the public, private and education sectors attended this workshop to gain a better understanding on how t build and perfect successful partnerships among diverse organizations in developing environmental education programs.

Dennis Nelson, Director of National Project WET, discussed his 15-year collaboration process with various organizations in developing Project WET. He discussed the fundamental ingredients of successful partnerships.

Craig Dent from the Bureau of Land Management discussed a multi-state effort which included public, private and non-profit sectors in developing a watershed restoration project, "Health to the Salmon!" in the Northwest. He emphasized how businesses participated with capital investments rather than community relations funds.

Niagara Mohawk Power Corporation in Syracuse, New York, has established partnerships with environmental groups and governmental agencies to promote and disseminate programs which address wildlife habitat, endangered species, and dwindling natural resources. These programs are used by middle and junior level students throughout the Syracuse area. G. Rob Scott, Environmental Communications Manager, emphasized how these programs have established the Niagara Mohawk Power Corporation as a responsible corporate citizen.

Lori Wingerter from General Motors and Cathy Relyea from Earth Generation Inc., discussed the role of business in environmental education. Both women elaborated on how their particular partnerships evolved. General Motors has been involved with the Global Rivers Environmental Education Network (GREEN) since 1989. Earth Generation Inc. facilitates environmental partnerships between corporations, non-profit environmental groups, and government.

In every partnership, there must be a understanding that the partnership is environmentally ethical. Dr. Steven Bissell, Colorado Division of Wildlife, emphasized that partners need to address possible controversial issues before entering into a business or corporate partnership, e.g. are the industry's activities environmentally sound and if not, should there be a partnership?

Tom Benjamin, Alliance for Environmental Education, discussed the creation of the Environmental Alliance for Senior Involvement, a public/private partnership that exemplifies how government agencies, non-profits and corporations can create and fund a new organization. His program is a model of how existing organizations can collaborate to develop and implement a new program.

EcoLogic consultant, Anne Camozzi, gave a slide presentation of a unique award-winning environmental education program for 1200 employees of a pulp and paper company in Canada. She discussed the critical components in designing and facilitating industry environmental education programs.

Al Stenstrup, Wisconsin Department of Natural Resources, led participants through a marketing approach to determine their organization's strengths and resources. The activity was designed to assist attendees in identifying their potential partnerships.

In addition, a video produced by The Video Project, "Greenbucks" the Challenge of Sustainable Development," was shown. It was produced to inspire businesses to consider fundamental changes in their attitudes towards the environment and economics. The video included several successful European projects.

Attendees also received copies of several different partnership materials including those produced by: McDonalds/EDF, Ben & Jerry's, WMX, Clorox, BLM, Island Industries, Environmental Media, Earth Generation/Niagara Mohawk/EPA/National Audubon Society, Dow Chemical, Proctor and Gamble, the WILD Foundation, Wisconsin Department of Natural Resources, Animal Tracks/Wal Mart, Project GREEN/GM, the Alliance for Environmental Education, KC Publications/National Project WET. Many attendees also brought materials to share. Copies of The Green Business Letter and In Business (environmental, entrepreneuring) were given to each attendee as well.

A group of speakers and attendees drafted a resolution urging NAAEE to expand their support of partnerships through the formation of a committee to "explore and implement ways NAAEE can promote and network coalitions and partnerships to accomplish environmental education projects." All those in attendance voted to support this resolution.

Developing Teacher Training Programs

Martha Monroe and David Cappaert,
National Consortium for Environmental Education and Training,
University of Michigan

With Resource People:

Kristina Allen, Arizona Department of Education
Randy Champeau, Wisconsin Center for Environmental Education
Jim Martin, FEESA
Robert Raze, Florida Department of Education
Dennis Yockers, Wisconsin Department of Public Instruction

Friday Evening Group Discussion

The workshop began Friday evening with nearly 100 environmental education teacher educators from school districts; small centers; county, state and federal agencies; and local, national and international environmental organizations. The workshop had two broad goals: 1) to establish an environment where participants could share their ideas, resources, and expertise with each other, and 2) to engage participants in discussing critical issues in EE teacher training with several resource people from regions where strong advances have been made.

That evening, participants generated several rules of thumb and useful guidelines for issues they find particularly challenging. Below are their suggestions.

Designing Effective Professional Development Programs

Good, programs depend on: preparation and organization; accurate assessment of audience needs; high quality information; interesting & motivational delivery; evaluation & follow-up. An effective program has 5 key elements:

- Know the audience Survey their needs and expectations. Make the program relevant by paying special attention to their prior knowledge, goals, level, culture, and needs. Supply pre-visit information or an advance organizer to set appropriate expectations. Be aware of special multicultural concerns.
- Provide incentives for attendance, such as resources, materials, keynote speaker, handouts, freebies, food, great topic, credit, salary upgrade possibilities, etc. Include tools to make material "integrate-able"... to enhance what they teach. Show them how to infuse EE into their curriculum and provide the tools for doing so. Model good teaching techniques and excellent questioning techniques.
- Methods should be participatory, effective, fun, attention grabbing, high interest, interactive, meaningful, useful, practical, relevant, hands-on, experiential, and address all learning styles (audio, visual, active).
- Evaluate the program and provide follow-up workshops, extension, materials, mailings, or contact of some sort. Model the use of outcome-based assessment.

Motivating teachers to attend EE workshop

What barriers exist to teachers attending workshops? Major categories are:

limited time and money
lack of administrative support/incentives
lack of relevance to current curriculum
history of poor quality programs
fear
"perceived" barrier
competition

How can we "sell" EE to teachers?

General issues. There is a need for broader awareness of the money available for teachers to attend workshops. Teachers may need to be convinced that they need what a workshop offers, and agency people may need to be convinced that their knowledge is needed by teachers and others. People need to know the workshops are available--providers, consumers, and politicians. We need to demonstrate where EE fits and how it can be integrated into what teachers already cover. We need to bring together existing funding resources to improve implementation.

To improve distribution of information about EE and EE workshops, we could use the following strategies:

--newsletters, flyers
--direct mailing to teacher or school building representative
--union newsletter
--calendar of events
--child car centers: newsletters and bulletin boards
--TV, radio, newspaper through university
--telecommunications systems
--word of mouth
--direct visits to faculty meetings; PTA, PTO
--excite the kids; science fairs
--booths at conferences and teacher meetings
--insert in paycheck; be at the bank on payday!

Solutions to these barriers and challenges lead us to:

--integrate EE into curriculum and model it
--localize the information
--make programs easy to attend and facilitate
--give prizes
--make them fun
--give inservice credit, college credit, CEU endorsements
--provide funding, combine funding sources
--give free materials
--coordinate the agency programs, interagency workshop
--provide resource directory
--make sure program is well-facilitated

Steps for designing workshops that motivate teachers:

- Identify the reluctance and the needs; provide consultant to help them ID needs and local resources. Emphasize process, an interdisciplinary approach, exit outcomes, problem solving, learning styles, citizenship
- Make solutions simple, flexible, teacher-friendly and relevant to their situation. Key the materials to their framework/teaching objectives. Provide local publication of successful lessons & take these services on-site
- Create a system of incentives--recognition, stipends, graduate credit, pay, materials. Encourage administrative support
- Provide for resource library with flexible hours. Make it easy: boxes, kits, trunks, reference books, trade books
- Evaluation, feedback, and support

What are useful sources of information and assistance for EE?

Teachers
electronic media
coordinators
conferences
volunteers
community members
visual/audio media
newsletters
clearinghouse/hotline
library
grants
other classrooms

- within the school system--newsletter, bulletin board, doors
- partnerships with private/nonprofit/public agencies
- workshops/courses/special events

Saturday morning

On Saturday morning, the resource people participated in a panel discussion of EE inservice teacher education programs that they coordinate. The four different regions vary in their legislative approach to EE, but share a creative energy for program design and a strong commitment to building partnerships with other agencies and organizations to pool limited resources and make things happen. A brief summary of their programs follows:

Florida Department of Education; Robert Raze

The Florida Department of Education uses the State Committee on Environmental Education (SCENE), composed of representatives from state agencies with a stake in EE, to coordinate inservice for environmental educators. At the state and regional levels, inservice for public school teachers is primarily coordinated and delivered by the Department's five regional environmental education service projects (RSPs). They sponsor or cosponsor the inservice, recruit teachers, and assist teachers in receiving inservice credit. Teacher training is also offered by nonprofit organizations, environmental education and nature centers, local government agencies, and businesses.

Credit is available for teachers to take EE inservice for both teacher certification and recertification in other subjects. Because EE is not mandated in Florida, and therefore EE inservice is not mandated, EE inservice credits are given in ecology, science, social studies, math, or other subjects or in teaching processes such as problem-solving or critical thinking skills. EE inservice components must be approved by each school district and teacher education center before teachers can received inservice points. In some cases, RSPs or agencies, in conjunction with post-secondary institutions, provide inservice programs that offer either points for certification/recertification or college credits.

Teachers most likely to attend inservice are those that are motivated, well-informed about inservice opportunities, and have administrative support to attend. For example, the district must commit to hiring substitute teachers, which would allow a teacher to attend inservice on a workday.

Inservice providers need a strong network of agencies, nonprofits and businesses interested in EE to assist in supporting the inservice both financially and logistically, in spreading the word, recruiting teachers, and lining up presenters. They also need experience and expertise in both teaching the EE content and the methods used to teach it, and how to integrate it into different subjects. They also need information on evaluating their inservice programs and following up with teachers to assure that the inservice information is used.

The 1989 Environmental Education Act in Florida directs the Department of Education to provide services for teachers, districts, and institutions that wish to integrate EE into their curricula, but does not mandate that EE be taught as part of the curricula. Thus, there is no legislative mandate for EE inservice in Florida.

Robert Raze, Office of Environmental Education; 325 W. Gaines Street, Room 224-C; Tallahassee, FL 32399-0400. (904) 487-7900.

Environmental Education Inservice in Alberta; Jim Martin

Environmental education does not have a specific curricular niche in the Alberta curriculum but rather is found integrated into a variety of subject areas throughout the K-12 program in science, social studies, and natural resources studies among others. EE is not well coordinated through the curriculum and therefore tends to support a "niche" approach where educators can find opportunities to address some environmental topic or issue within a relatively restrictive period of time. Because of these factors, the Department of Education has not taken a strong leadership role in EE or in the development and support of inservice but rather has left this support to other government agencies and NGOs.

Inservice programming is offered by a wide range of agencies and organizations with the major source being the provincial government agencies, with the Alberta Environmental Protection leading the way. Alberta's Department of Education has kept mainly to a role of guide and coordinator in the delivery of EE inservice. Municipal governments, mainly the Cities of Calgary and Edmonton, offer programs usually through their public works and utilities areas. Non-governmental organizations such as FEESA, SEEDS, and the Alberta Forestry Association, Global Education Project, Science Alberta Foundation, and Imagination Market would be considered major sources of inservice programming and support.

School jurisdictions and professional units and specialist councils within the Alberta Teachers' Association have had a large hand in providing venues for the aforementioned organizations to deliver their programs. Industry and business have tended to work through the NGOs providing financial and technical support. Environmental NGOs have only provided minor direct support for inservice with more significant indirect support by assuming advisory roles. Universities and colleges in Alberta have not been significant sources of non-credit inservice programming electing to remain with preservice and graduate degree and diploma programming. The University of Alberta relies heavily on EE inservice providers like Alberta Environmental Protection's Education Branch to meet the demand for a mandatory environmental studies course for elementary education students.

The Alberta EE Inservice audience is concentrated at the upper elementary (grades 4-6) using interdisciplinary and multi-disciplinary approaches; junior secondary (grades 7-9) with a major focus on general science and environmental and outdoor education complementary program. Significant programming is also offered to the primary (K-3) and a recent focus on the secondary general science course.

Without specific direction inservice programming has ranged widely in the approach and organization. In time, inservice ranges from the one hour "quickie" to the 12 day "relationship". In approach, programs vary from formal presentation to workshop, to field or lab program, to learner-driven, to self-directed, and beyond. One of the great difficulties in reporting this area is not only the quantity and variety of program but the lack of evaluation and reporting. Of special note are the Alberta Environmental Protection's "ultimate" workshop where teachers can experience a wide range of programs at one time, and FEESA's intensive 9-12 day series of "institutes" in which teachers live and learn together with a focus on one major environmental theme.

Jim Martin, FEESA, 320, 9939 Jasper Avenue, Edmonton, Alberta T5J 2X5. (403) 421-1497

Beverly Yee, Education Branch, Alberta Environmental Protection, 9820 - 106th Street, Edmonton, Alberta T5K 2J6. (403) 427-6310.

Wisconsin's Environmental Education Initiatives; Dennis Yockers

WEEI is the result of an unofficial coalition of agencies and organizations. Major members include the Wisconsin Department of Natural Resources, the Wisconsin Department of Public Instruction, University of Wisconsin System, Wisconsin Board of Vocational, Technical, and Adult Education; Wisconsin Educational Communications Board; Wisconsin Association for Environmental Education, and numerous environmental/nature centers. There are many other agencies and organizations involved.

WEEI's underlying philosophy is that citizens bear a responsibility to become active participants in the prevention and resolution of environmental problems and issues. To do so effectively, they must possess; 1) awareness and sensitivity to the environment and its problems; 2) an understanding of how the natural world functions, how humans interact with it, and how harmony between the two can be achieved; 3) positive attitudes and values related to the environment; 4) certain skills which will enable them to act on behalf of the environment, and 5) real world experience in preventing and resolving environmental issues and problems.

Some of the main WEEI program elements include the following:

As of July, 1985, all teacher certification candidates in early childhood, elementary, middle, agriculture, science, and social studies education must demonstrate seven competencies in EE: four in environmental studies and 3 in EE methodology. Teacher preparation programs at Wisconsin colleges and universities are reviewed and approved every 5 years by the DPI.

Since September, 1990, all school districts must have developed and be implementing curriculum plans for all subject areas into which EE has been incorporated. Curriculum plans in art, health, science, and social studies education must show the greatest emphasis on EE.

A publication, *A Guide to Curriculum Planning in Environmental Education*, was published by the DPI in 1985; a revision will be available in 1994. It presents a model based on 5 subgoals: Awareness, Knowledge; Attitudes and Values; Citizen Action Skills, and Citizen Action Experience.

The Wisconsin Environmental Education Board was created in 1990 to determine and provide direction for the education of all Wisconsin citizens and administer yearly a $200,000 state grants program. Over the last 4 grant cycles, 105 projects have been funded.

The Wisconsin Center for Environmental Education was established within the College of Natural Resources at the University of Wisconsin-Stevens Point in 1990. Its major emphases are inservice K-12 teacher education, providing consultant help to other higher education institutions, working with the DPI to assess environmental literacy of teachers and students, operating an EE resource reference center, and coordinating the Wisconsin School System EE Network.

Strong programs in PLT and WILD have trained thousands of teachers throughout Wisconsin, led by the DNR.

A quarterly newsletter, *EE News*, is published cooperatively by the DNR, the DPI, the WCEE, WAEE, and UW-Extension. A yearly subscription is $5.00.

Dennis Yockers, Department of Public Instruction, P.O. Box 7841, Madison Wisconsin 53707-7841. (608) 267-9266.

Arizona's Environmental Education Act; Tina Allen

The Arizona Legislature established a clear mandate for environmental education in 1990 by stating that public schools, community colleges, state universities and state agencies integrate environmental education throughout the educational system and public education programs so that awareness of students and the general public is thorough, continuous, and meaningful. A variety of programs have been put into place to implement this goal:

The Environmental License plate was created to fund the statewide EE initiative. The specialty plate sells for $25.00, $17.00 of which goes to the EE Fund at the Arizona Department of Education (ADE). In less than one year, the plate generated over $100,000 for EE.

The ADE's EE Fund provides money for personnel and other expenditures necessary to assist school districts in implementing EE programs, such as teacher training. Money comes from donations, appropriations, and the sale of the E license plate.

School districts are required to develop and implement programs which integrate EE into the curriculum. Students will be assessed on their understanding of environmental concepts and skills. The ADE developed EE Guidelines to illustrate how EE concepts can be integrated with 10 of the state Essential Skill documents. Each school district will receive a copy to assist them in the curriculum development.

The ADE is establishing an information resource system in two entities: the Resource Center Sites and the Telecommunications System. The Sites will be established in phases. In the first phase, urban areas will be invited to submit RFPs. Once 5 sites have been selected and resources purchased for them, their directors will be involved in establishing accompanying satellite and rural sites. The Telecommunications System will have a bulletin board for communication, a database by region of potential field trip sites and guest speakers, a bulletin board for programs, workshops, and courses, a database of research data collected by state agencies and organizations, and a database of EE resources and materials. Each Resource Site will be linked to the Telecommunications System and will help enter information.

Each university will provide training in environmental education by incorporating EE into the teacher training programs. New courses are expected to include EE. Universities are also expected to provide courses, workshops, and programs for inservice teachers in EE.

An Interagency Committee comprised of 15 state agencies was established to encourage coordination of EE activities, distribution of information and the provision of assistance in implementing the mandate. The Committee sponsored the first annual EE Resource Fair in 1993. About 800 educators attended to receive information, materials, learn about opportunities and network with others.

The EE Academy brought together a diverse group of educators for a week to expand their knowledge base and develop an action plan with their colleagues to implement an EE plan in their communities. Participants received a box of resources and $35 to order books to help them implement their plan. Two follow-up sessions are planned for the fall.

Kristina Allen, Arizona Department of Education, 1535 W. Jefferson, Phoenix AZ 85306. (602) 542-3052.

Saturday afternoon

Four concurrent sessions were available for participants to choose among, based on a needs assessment that they mailed to NCEET in early September. Those sessions were: Designing Workshops, Evaluating Programs, Motivating Teachers, and Facilitation Skills. The resource people and coordinators teamed up to offer these short sessions.

For the bulk of the afternoon, participants worked on one of 12 scenarios -- different challenges in EE K-12 programs. Once in their scenario groups, participants discussed their problem and identified three questions they could ask of other participants. During the Consultant Fair, these questions were used to "advertise" for consultants; participants moved from table to table to offer advice. Returning to their own groups, participants reflected on all the advice they received and fashioned their own response to the task and in some cases, revised the task to be more meaningful to them. Several scenarios and a summary of the group's presentation notes are provided as an example of the afternoon activity.

Scenario 1. You are a group of professional EE folks and teachers from several different organizations and school districts in your region that meets occasionally as an EE-support group. Although you are all PLT/WILD facilitators and think they are good programs, you see a need to help teachers move beyond their typical approach of piecemeal activities. Task: Decide what you want teachers to be able to do in EE and outline an approach to get them there.

Awareness:

Expose teachers to other options: workshops with thematic approaches and utilize organizations' expertise, materials, funds
Provide foundational training in every workshop
Utilize such activities as a hook: "we can do it," "see success," "model"
Build teacher networks within a school

Action:

Develop site specific programs to avoid the piecemeal approach
Use a local site as a focus and pay teachers to develop activities

BEST COPY AVAILABLE

Develop site activities by grade to suggest a progression of ideas that will investigate the site
Students will "know their place"
Involve these teachers in workshops at other schools as leaders

Scenario 2. You are the EE person in a resource management agency and have been asked to develop a 1-day inservice for middle school teachers on the development of thematic units which focus on environmental topics. Every school will send a grade-level team of 5 teachers (science, math, social studies, language arts and 1 specialist in art, music, vocational training health, technology or phys ed). Task: Design the inservice agenda considering what will be covered, how you will plan for it, and how you will evaluate it.

How do we conduct an effective needs assessment?

- "Ownership" by inviting teachers for focus group brainstorming session, prior or during the workshop
- Making personal acquaintances and contacts with school teachers, administrators, school board, parents, PTA, etc.
- Determine how thematic units will meet core curriculum objectives/requirements
- What haven't teachers seen yet? Which environmental topics haven't been addressed?
- Be specific about what your resource agency can offer and how their needs can fit into a given format.
- Start small with a pilot program (one school)

How do we develop a personal commitment to teaching environmental topics thematically?

- Develop ownership via focus groups and inclusion.
- Parent involvement, business support, community interests
- Show effective models that work
- Adopt-a-Teacher program

How do resource management agencies establish credibility with the teaching community?

- Use their curriculum and meet their objectives and needs
- Adopt-a-Resource-Person
- Team Teaching Approach at the workshop with several facilitators
- Have EE specialists (educators) on staff at the resource agency

Scenario 3. You are a team of EE professionals in the nonformal sector in a metropolitan area (zoo, nature center, museum, utility company). Although you all offer fine programs and excellent workshops, you have noticed that your clientele tend to be from the suburbs, not the city center. Task: Outline an effort to involve urban teachers in EE. Design a course or workshop, if that is a part of your outline, and determine how it would be evaluated.

Strategic Plan: Definition, mission, goals/objectives, needs assessment. For assessment, use librarians, teachers, PTA, school administrators, non-formal education organizations.

Communication/Outreach: cultural groups, network with other programs, unconventional groups, in-class component, representatives from non-formal organizations serve as project leaders, host informal education fairs, weekend packages for families, discount coupons for teachers, resource guide to non-formal opportunities, volunteers from non-formal education organizations do outreach into schools.

Program Parameters: Natural processes, human, interaction, solutions, effect on the individual

Barriers: funding, travel, need for partnerships, resource availability, fears relating to urban and natural environments, transportation

Evaluation: based on needs assessment, behavioral change, student opinions

Scenario 4. You teach EE at a nearby university, and although you tell teachers that EE is interdisciplinary, most people seem to think it is a part of the science curriculum. You have a difficult time selling non-science teachers on the idea of EE or to enroll in your courses. Task: Outline an effort to help non-science teachers build EE into their curriculum. Design a course or workshop, if that is a part of your outline, and determine how it would be evaluated.

- Identify a community issue (e.g., town landfill)
- Locate community professionals representing different professions (e.g., artist, engineer, city planner) to form a panel creating a Community Education Consortium to support the training
- In-service District-wide workshop for ALL teachers in ALL subject areas to present a model for infusion of EE across the curriculum
- Evaluation: Each school system develops a model of EE integration that is interdisciplinary

More Ideas:

- Creative writing exercises; have kids role-play
- Use a relevant theme and draw all subjects into it
- Create blocks of time where teachers team teach
- Make learning relevant to their lives
- Determine the required learning skills for state by subject area and identify EE materials that teach these elements
- Teachers must first be committed to the ideas of EE
- Provide personal experiences for teachers, of the emotional sort
- Get teachers to develop the curriculum in teams of 3 subject areas
- Work with groups of teachers from various subject areas, identify a local issue and ask them how their subject area is tied to the issue. This will encourage collaboration
- Provide research resources
- Ask to talk to Teachers' Association and their Professional Development Committees
- Socratic method of questioning; turn it back to them and self-discovery
- Community presenters from different careers model the topic in each discipline
- The purpose: a Global concept--everything is interconnected
- Offer EE programs for one subject area at a time (math, English)
- Education focuses on WHAT to know; EE moves them to HOW to think
- Need EE materials by non-science subject areas to infuse EE across curriculum

Scenario 5. You are the EE coordinator for the state/provincial education agency. You are pleased with the way elementary teachers have registered for workshops and integrated EE into their curriculum. Secondary teachers resist--they don't think they need to learn anything and they are bound to their textbook. Task: Outline a one-year plan and five-year strategy to bring secondary teachers into the EE arena. Design this effort to include networking opportunities, resources, and workshops.

First year Goals:

- One Day EE Day with EE in every department
- Small percentage of schools with interdisciplinary teams to develop model
- One interdisciplinary unit adopted by model schools
- Establish team of students that will develop list of local issues that will be integrated into model schools.

Five year Goals:

- Establish pre-service training based on interdisciplinary approach
- Develop curriculum on interdisciplinary approach
- Facilitate administrative support and dollars
- Establish permanent EE Consultant position in each state for Peter Schmidt(!)
- Secure legislative mandate

Scenario 6. You are the EE coordinator for a regional resource agency and you interact with a large number of EE workshop facilitators. You realize that some of them are not very effective because they have poor facilitation skills and little knowledge of what teachers actually do in the classroom. Task: Design a program to train EE trainers in needed skills and evaluate their progress.

This group developed a flow chart of possible directions the assessment might suggest. For example:

The problem:	The solution:
Workshop Materials Inadequate	• determine more appropriate structure incorporating the facilitators in this process
Poor Skills	• workshop on communication, workshop design, facilitation skills
	• role-playing, peer review
	• pairing with successful facilitators
Lack of Information on teachers	• classroom observation
Detachment from program	• mentoring program between teachers/facilitators
Lack of feedback/evaluation	• grants to attend teacher training
	• videotape for evaluation
	• annual self-evaluations
Mix of the above	

Summary

Most of the scenario presentations focused on very similar processes and skills for improving teacher training in environmental education. Of critical importance is the need to involve the teachers in early stages of the program, most often through a needs assessment or program design. Particularly where educators are working with groups that are new to EE (non-science teachers, urban teachers, secondary teachers, etc.), there was a significant feeling that the assumptions that have worked in the past should not be trusted. In recognition of the challenges to EE in finding resources, finances, and incentives to attract teachers, many groups also suggested that significant attempts be make to create partnerships, to work with organizations and agencies which do not have a strong history in EE, and even with businesses and industries.

Finally, most groups emphasized the need to evaluate programs and continue to communicate with teachers through creative follow-up efforts: newsletters, activities, resources, postcards, additional workshops, meetings, etc. Efforts to work with administrators to begin to restructure the systems that restrain teachers' EE efforts was also mentioned.

The workshop ended with an evaluation and the promise of follow-up: workshop participants will receive documentation of the summaries of group presentations and will have an opportunity to critique NCEET's draft units of a Workshop Resource Manual in the EE Toolbox. Participants received copies of the draft units and of Getting Started: A Guide for Bringing EE into the Classroom. NCEET: School of Natural Resources and Environment, University of Michigan, Ann Arbor MI 48109-1115. (313) 998-6582.

Innovative Student Assessment in Environmental Education

Nancy Murphy, Antioch University Seattle
Peggy Cowan, Alaska Dept. of Education
Diane Cantrell, Ohio Department of Natural Resources
Bill Andrews, California Department of Education
Peggy Cowan, Alaska Dept. of Education, Div. of Educational Program Support

This paper presents a brief overview of the purposes of assessment and innovative strategies to assess for those varied purposes. Examples are drawn from national environmental education programs such as Project Learning Tree, Project WILD, Sharing Nature With Children, and Class Project.

Traditional Assessment and Recent Alternatives

Traditionally we have used assessment to measure retention, a summative process put to normative use. Formative processes of assessment (those activities that tell the teacher what the student understands and what needs to happen next in instruction) have traditionally occurred informally. This workshop addressed only those areas of assessment that are valuable for the purposes of instructional decision-making (the formative purposes), with suggestions of how to document these to satisfy some summative purposes through a strategically-designed portfolio.

Redefining Assessment in the Service of Instruction and Learning

Every individual enters an educational experience with a set of images about the topic. The theories of constructivism suggest that learning actually consists of each individual's efforts to modify these images (or schema) to accommodate or reject new information and experiences. Consequently, we are now refocusing our attention in assessment to evaluate the degree to which students construct meaning for themselves (instead of looking at the degree to which they accept information as we present it). It should value growth over mastery, and it should support lengthy periods of practice and accomplishment before expecting further growth.

Assessment should also accommodate a variety of learning styles and intelligences. Awareness, knowledge and action take many forms. We need to search for the mode in which these are being communicated, and we need to help students broaden their range of expression.

We are also searching for assessment strategies that validate unspoken issues of power in the classroom. If the purpose of the lesson is to develop or reinforce student empowerment, then the assessment should be responsive to the individual's personal sense of empowerment, either through self assessment or student input into the performance criteria. If the lesson targets concepts or behaviors identified by the instructor, then the expectations should be explicitly itemized in the assessment tool. This tool should in turn be used as a communication device, one that relieves the student from the guesswork involved in pleasing the teacher.

Issues in Assessment from an Environmental Educator's Perspective

Considerations in Unit Design

Environmental educators have traditionally organized educational activities around a sequence of awareness, knowledge, and action. The effect of this influence is evident in the wide acceptance of a Learning Cycle Model for science instruction. Although the literature contains numerous variations, a learning cycle model approach generally contains at least three stages. It begins with an initial engagement phase which activates student interest and elucidates students' prior knowledge or schema for the concept. This is followed by an exploratory phase in which the student interacts with the objects to gain an intuitive sense of the phenomenon in question. This phase usually includes guided discoveries during which the students "invent or discover concepts" that give meaning to the experiences of the exploratory phase. Finally, the students apply their newly learned concepts and skills in additional contexts to practice them and to extend the range of their usefulness (Gallagher, 1979; Murphy, et al, 1989). The result is a somewhat flexible sequence including engage, explore/discover, and extend.

The similarities between the environmental education sequence and the learning cycle model can be roughly compared as follows:

ENVIRONMENTAL ED. SEQUENCE	LEARNING CYCLE MODEL
Awareness	Engagement and Assessing Preconceptions
Knowledge	Exploring Concepts and Communicating New Discoveries
Action	Extending/Applying Concepts in New Contexts

Note that a primary difference is that the environmental education sequence emphasizes knowledge for the purpose of action, with student action becoming the motivator for knowledge development. The Learning Cycle Model emphasizes the importance of student discovery and ownership of new conceptual schema, using application or action as a verification of the transferability of these new concepts. The two are compatible and interchangeable. We highlighted portions of both throughout this workshop.

Types of Environmental Education Teaching Strategies

Environmental educators flaunt an appealing diversity of teaching strategies, ranging from expository modes to more student-centered methods. The following list of familiar activities represents the range:

TEACHING STRATEGIES	EXAMPLES OF ACTIVITIES	SOURCE OF EXAMPLE
Exposition	Short Takes	NatureScope: Endangered Species
	The Hunters	Project WILD
	A Letter from Archy	Project Learning Tree
Computer Assisted Instruction	SimCity	Maxis
	Decisions, Decisions: The Environment	Tom Snyder
Discussion	Most Activities	most curricula
Demonstrations	Crack, Crumble and Carry	NatureScope: Pollution
	Prime Parts	NatureScope: Birds,Birds,Birds
Drill and Practice	Few Activities	
Recitation	Few Activities	
Guided Imagery	Stormy Weather	Project WILD
	Tree Imagery	Sharing the Joy of Nature
	Another Way of Seeing	Project Learning Tree
Brainstorming	Aqua Words	Aquatic WILD

	Ethi-Thinking	Project WILD
	Which Should I Buy	Project Learning Tree (S)
Sensory Awareness	Blind Walk	Sharing the Joy of Nature
	Urban Nature Search	Project WILD
	Adopt-a-Tree	Project Learning Tree (E)
	Micro Trails	Acclimatizing
Investigations and Experiments	River Cutters	GEMS (Great Explorations in Math and Science)
	Animals in Action	GEMS
	Animal Movement in Water	OBIS
	Owl Pellets	Project WILD
	A Field, a Forest and a Stream	Project Learning Tree (E)
	Water Canaries	Project WILD
	Soil Soakers I, II	AIMS: Water Precious Water
Games and Simulations	Bat & Moth	Sharing the Joy of Nature
	Build a Tree	Sharing the Joy of Nature
	Catch Me If You Can	AIMS: Critters
	Hooks and Ladders	Aquatic WILD
	How Many Bears Can Live in This Forest	Project WILD
	Population Game	OBIS
	Forest Concentration	Project Learning Tree (E)
Role Playing	Dragon Fly Pond	Aquatic WILD
	My Use of Your Use or Our Use	Project Learning Tree (E)
Individual and Group Projects	Here Today, Gone Tomorrow	Project WILD
	Fashion a Fish	Aquatic WILD
	Build a Mangrove	NatureScope: Wading Into Wetlands
Peer Teaching	Many Activities	
Debates	Pro and Con	Project WILD
Surveys and Questionnaires	Surveys and Slogans	NatureScope: Wading Into Wetlands
	Living Research: Aquatic Heroes and Heroines	Aquatic WILD
	Interview a Board Worker	Project Learning Tree (E)
	Wildlife Issues: Community Attitude Survey	Project WILD
Case Studies	Local Examples	
Issue Analysis and/or Investigation	What Did Your Lunch Cost Wildlife	Project WILD
	Forest Consequences	Project Learning Tree (E)
Moral Dilemmas	Ethi-Reasoning	Project WILD
	A Look at Lifestyles	Project Learning Tree (S)
	Values Clarification: A Handbook of Practical Strategies for Teachers and Students	Simon et al
Community Studies	Planning for People and Wildlife	Project WILD
	Keeping Score	Project WILD
	Plan Your Community's Future	Project Learning Tree (S)
	Investigating and Evaluating Environmental Issues and Actions	Hungerford et al
Problem Solving	Education in Action: A Community Problem Solving Program for Schools	Stapp et al
	Migration Barriers	Project WILD
Action Projects	Monday Group	Project WILD
	Can Do	Project WILD
	Improve Your School Site	Project Learning Tree
	Can You Help!	NatureScope: Rain Forests
	CLASS Project	National Wildlife Federation

Matching Assessment to the Unit Purposes

We have found that it is difficult to design an assessment tool for a particular environmental education activity or teaching strategy outside of the context of an instructional unit. It is more productive to develop assessment tools based upon the activity's role within the purposes of the unit. For example, a simulation can be used to communicate students' preconceptions, to reinforce a concept, or to apply or transfer a concept. Different assessment tools would be appropriate for the different purposes of the simulations. For this reason we have chosen to organize this workshop by presenting strategies that are categorized by the purposes of instruction.

Types of Assessment Strategies for Different Purposes of Instruction

Assessing Conceptual Change or Mastery

If you accept the premise that all of your students have unique schema about the concept you are addressing, and if you assume that in order for a student to thoroughly engage in the educational activity s/he must somehow make connections between the activity and the current image, then it follows that you might want to provide multiple entry points for engagement so that all of your students are motivated. The first step in this process is to assess those preconceptions. The following sequence is recommended:

- identify current knowledge structures
- acknowledge current understandings and support communication of reasoning
- provide an initial activity that engages all of these schema
- provide small challenges to current schema that are within the reach of each student

The next step is to assess the step-like progress that students make as their schema shift and evolve to accommodate and explain new experiences. We call this assessing conceptual change.

As mentioned above, students come with unique preconceptions. They also construct new meanings by modifying those existing preconceptions one step at a time. This means that we must manage complex classrooms in which each student is engaged in the unique task of analyzing and modifying his/her current knowledge base. This is not as difficult as it might sound.

Most environmental educators are concerned about encouraging students to become effective stewards of Planet Earth. The environmental concepts are indeed fairly straight forward and simple. The number of contexts in which they are applied are complex and varied. We are not satisfied by the knowledge that students understand a concept. *We want to be sure that they understand the concept sufficiently to comfortably and creatively transfer that information to new situations in new contexts.* As educators, we want to support this ability to transfer, and we want to assess our success at this endeavor.

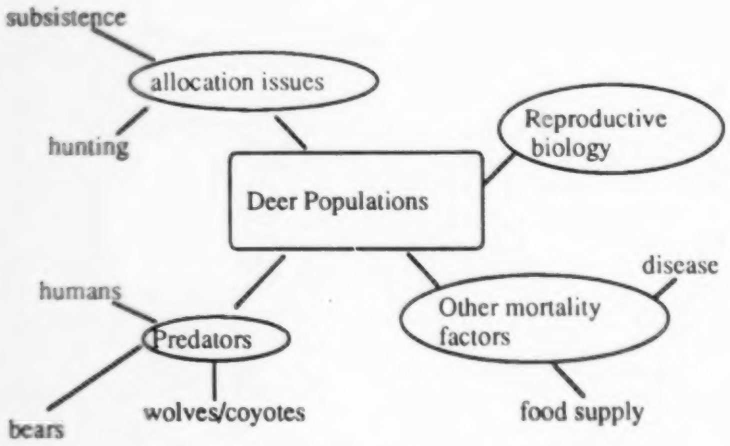
The following assessment tools can aid educators as they manage classrooms to provide for effective conceptual change and mastery. The assessment tools encourage students to successfully communicate their schema, allow the teachers to document and validate the varied communication styles of their diverse students, and either clearly articulate teacher expectations to the students or allow students to participate in the development of criteria.

Concept Mapping

Also known as webbing and bubble diagrams, concept maps are connected collection of words that represent one's understanding of the relationship between ideas. Concept maps have the following advantages:

- They permit a variety of "right" answers to surface
- They permit the comparison of student understanding to expert knowledge
- They improve everyone's understanding as we search for personal and shared meaning
- They illuminate preconceptions, and your students begin to ponder and communicate the organization of their ideas.

Sample concept map


subsistence
allocation issues
hunting
Reproductive biology
Deer Populations
disease
humans
Other mortality factors
Predators
bears
wolves/coyotes
food supply

Teachers often ask students to create concepts maps using the following phrase:

"Tell me what you know about _____________ (the concept)? As the students share their current knowledge, the teacher writes the words and phrases on chart paper. It often helps for the teacher to have in mind a visual image of the way s/he has organized the instruction around the concept (I call this an organizational template). This will help the teacher decide where to place the student ideas on the chart paper. The resulting student-created concept map provides information on how much the students know about the upcoming unit and how they organize that knowledge.

After the teacher has modeled concept mapping on chart paper for the class several times, the students will be ready to create their own individual concept maps. You can either ask them what they know about the concept or provide them with relevant terms to organize in a concept map.

Prior Knowledge Charts

Poll your students in the engagement phase on what they know and what they want to find out about your topic. Take a tally on what they learned/discovered in the explore phase.

WHAT WE ALREADY KNOW:	WHAT WE WANT TO FIND OUT:

WHAT WE LEARNED:

DISCOVERED PRINCIPLES:

Rubrics

CHECKLISTS: Checklists are easy ways to keep track of student behaviors. In this case, the teacher need only note that a behavior exists. Checklists encourage teachers to organize their thoughts about outcomes. They can also help us to review whether or not we are focusing on process skills, conceptual development, attitudinal changes, behaviors, social development or other modalities. Students appreciate a checklist because it defines our criteria and minimizes their guess work. Teachers can refer to checklists to get a sense about what percentage of the class has not attained the expected outcome and then adjust instruction accordingly. Likewise, teachers can assign grades to total number of points accumulated by total check marks.

Likert Scales

A Likert scale is really a checklist which allows the teacher to note to what degree a behavior exists.

Analytical Trait Scales

Analytical trait scales are a variation of a rubric in which the specific levels of performance expectations have been articulated. In the case of this first example, the criteria and performance expectations are identified in advance by the instructor. The advantages of the analytical trait scale include:

- students are immediately aware of the expectations of the instructor and can act upon those expectations,
- scoring is consistent for each criteria,
- expectations which are unclear for students can be identified in advance, and
- they preclude the necessity to provide lengthy comments on assignments (since most of the standard comments have been predicted and included in the rubric, these comments are provided by a check mark in the appropriate cell).

Analytical trait scales also have a few disadvantages. Some complain that they create too much consistency in the output of all students, squelching creativity. Several strategies have evolved to address those concerns:

- Attach an additional criteria at the end which is labeled Creative Approaches. Students are then assigned additional points if they extend themselves beyond the instructor's expectations or imagination.
- Add one criteria labeled Personal Criteria. Students identify and self-score one criteria that they set for themselves.
- Perhaps the most effective strategy is for the instructor to provide a blank rubric to the class followed by a discussion his/her initial expectations and the reasons behind them. Then the class can decide as a group what expectations might be reasonable for them and what behaviors/outputs might indicate various performance levels.

Holistic Scales

Holistic scoring provides one score for performance on a number of combined criteria. It does not break the performance into the task analysis categories (in contrast to analytical trait scoring). A holistic scoring rubric often lumps the individual performance indicators of an analytical trait scale together. Some teachers prefer holistic scoring because it more appropriately represents the real world (a concert pianist is judged on the effect of his/her total performance, not the breakdown of the individual skills). Other teachers prefer to give the students the specific feedback on each criteria, therefore adding more objectivity to the final score.

The following four sample rubrics illustrate the differences between Checklists, Likert Scales, Analytical Trait Scales, and Holistic Scales:

HABITAT CONCEPT CHECKLIST

Student Names

Criteria:															
Knows the four components of habitat															
Understands the interdependence of habitat components															
Can explain the impacts of human development and natural disasters on this balance															

HABITAT CONCEPT LIKERT SCALE

	No Evidence	Some Evidence	Effective Mastery
Habitat has four components: food, water, space and shelter			
Habitat systems maintain their own system of checks and balances; all of the components are interdependent			
Natural disasters and human impacts can alter this natural balance			

HABITAT CONCEPT ANALYTICAL TRAIT SCALE

	Emerging	Developing	Applying
Habitat has four components: food, water, space and shelter	Beginning to recognize the components	Can name all 4	Can name all 4 and transfer to other situations and populations
	Emerging	Developing	Applying
Habitat systems maintain their own system of checks and balances; all of the components are interdependent	Beginning to recognize that population dynamics are in response to habitat components	Knows that booms and busts occur but cannot adequately explain why	Can explain that habitat components become limiting factors before they are depleted
Natural disasters and human impacts can alter this natural balance	Beginning to associate impacts with effects on habitat	Associates disasters and human impact with habitat changes, but no specific examples	Identifies how disasters and human impacts affect specific habitat components; identifies effects on population dynamics

HABITAT CONCEPT HOLISTIC SCALE

Emerging	Developing	Applying
Beginning to recognize the components	Can name all 4 habitat components	Can name all 4 and transfer to other situations
Beginning to recognize that population dynamics are in response to habitat components	Knows that booms and busts occur but cannot adequately explain why	Can explain that habitat components become limiting factors before they are depleted
Beginning to associate impacts with effects on habitat	Associates disasters and human impact with changes, but no specific examples	Identifies how disasters and human impacts affect specific habitat components and population dynamics

Center Responses (Performance Tasks)

Many teachers create "worksheets" for students to use at centers. These guide the students through particular activities and aid them as they record their thoughts and results. Most performance tasks analyze the students' ability to apply the process skills of science (observe, classify, measure, infer, predict, experiment, communicate) to a particular situation or task.

FALLEN TASK CARD

1. LIST the animals (or evidence of animals) on your log:

2. CHOOSE ONE ANIMAL whose complete habitat could be supplied by the log:

3. LIST EVIDENCE of the components of that habitat:

Food:

Shelter:

Water:

Space:

Assessing Cooperative Groupwork and Consensus-Building Skills

Most educators agree that cooperative group strategies are important skills to develop. (Some educational theorists contend that we construct new knowledge as a result of social negotiation and consensus building.) As a result we are emphasizing activities which promote improved communication within and between groups, shared decision making strategies, and cooperative behaviors. Consequently, we want to assess our students' abilities to perform these skills. These might include assessing your students' ability to participate in a group, communicate ideas, stay on the topic, offer useful ideas, support and consider other ideas, and involve others to promote diverse contributions. The following rubrics contain ideas for assessment that can be adapted to a number of different formats and situations.

COOPERATIVE GROUPWORK SELF ASSESSMENT CHECKLIST:

A. Group Participation

Did my fair share of the work	
Did not try to dominate the group or interrupt	
Participated in group activities	

B. Staying on Topic

Paid attention, listened to what was being said and done	
Made comments aimed at getting the group back to topic	
Did not get off the topic or change the subject	

C. Offering Useful Ideas

Gave ideas and suggestions that helped the group	
Offered helpful criticism and comments	
Influenced the group's decisions and plans	

D. Consideration

Made positive, encouraging remarks about group members and their ideas	
Gave recognition and credit to others for their ideas	
Was considerate of others	

E. Involving Others

Got other involved by asking questions, requesting input, or challenging others.	
Tried to get the group working together to reach group agreements	
Seriously considered the ideas of others	

F. Communicating

Spoke clearly, was easy to hear and understand	
Expressed ideas clearly and effectively	

G. Overall Experience

This group helped me improve my understanding of the problems and the ways of solving them more than if I had worked alone	
Working with the group was an enjoyable experience	

A more complex cooperative group skill involves developing consensus among disparate interest groups. Since it can be assumed that everyone is ultimately concerned about a long and healthy life on a healthy planet, the challenge can often be redefined as recognizing common goals. Many strategies for developing this "Win-Win" philosophy are described in the book *Getting to Yes: Negotiating Agreement Without Giving In* (Fisher and Ury, 1981). One of the first steps, then, in investigating environmental and social issues involves identifying different points of view and developing a healthy awareness of factors that limit our own points of view. The following rubric identifies some of these skills and can be used with simulations, case studies and issue investigations.

POINTS OF VIEW LIKERT SCALE

Scoring Scales

Criteria	1 No Evidence	2 Some evidence presented; still working on effectiveness	3 Effective demonstration of skills/attitudes/ concepts	4 Complete mastery of skills/attitudes/ concepts and ability to apply to different contexts
How well does the student frame the issue? (Can s/he describe what the issue is about?)				
Can the student identify different points of view? (Different perspectives and reasoning supporting those perspectives?)				
How well does the student articulate his/her own point of view?				
Can identify source/basis of his/her opinions				
Can identify needs for additional info (what kind, where to find it, what info could make him/her change his/her opinion)				

POINTS OF VIEW LIKERT SCALE (ELEMENTARY)

	No Evidence	Rarely	Often	Always
The student can describe what the issue is about				
The student can state a personal opinion about the issue				
The student can suggest a solution to the issue				

ORAL CONTRIBUTIONS HOLISTIC SCALE

Points	Range of Oral Contributions	Anecdotal Evidence
0-2	Makes occasional contributions	
3-5	Makes occasional significant contributions and usually listens carefully and responds to the points made by others	
6-8	Usually effective, occasionally shows the ability to analyze previous contributions and take the discussion forward	
9-10	Pertinent contributions made on a wide variety of issues in both large and small groups without over dominating, able to lead a discussion when necessary. A good listener as well as a good talker	

(The Joint Matriculation Board Examinations Council; 1987)

Assessing Application, Action, and Empowerment

How do we as educators assess whether or not our academic concepts affect behavioral changes in our students? How do we then respond by changing our instruction to promote behavioral changes? This is not to suggest that all environmental education should promote behavior modification techniques but to encourage the promotion of critical thinking skills which transfer to critical-think-before-you-act-skills. This book suggests several strategies to assess this form of transfer, ranging from self-assessments to more covert methods. The following analytical trait scale includes criteria for taking action. They are useful for service projects, issue investigations, or STS approaches.

TAKING ACTION LIKERT SCALE

Criteria	1 No Evidence	2 Some evidence presented; still working on effectiveness	3 Effective demonstration of skills/attitudes/ concepts	4 Complete mastery of skills/attitudes/ concepts and demonstrates ability to apply to different contexts
Does new knowledge translate into ideas for meaningful action?				
Is there evidence of action taken?				
Is there evidence of consistency between personal point of view and his/her response to a salient event?				

Scoring Scales

STS LIKERT SCALE

	Always	Often	Sometimes	Rarely
The student identifies mutual influences of science, technology and society in relation to social issues				
The student strives to acknowledge many points of view and identify the sources of his/her own point of view				
The student engages effective problem solving and decision making skills				
The student engages in a societal or personal course of action after weighing the trade-off among values and effects drawn from various scenarios and alternative options				

Learning Logs/Contracts

Some teachers prefer a project approach to instruction in which students review issues, choose an action to accomplish, design a plan of action, and investigate scientific, technological, and social considerations in light of their project. Learning Logs are journals formatted to document these projects. They consist of at least three sections: 1) a contract which describes the project, timeline, and evaluation criteria; 2) a resource section that contains research information, relevant notes, diagrams, charts, bibliographies; and 3) the product which includes all working drafts and documentation of an authentic product.

Learning Contracts. Contracts are the vehicle for providing ownership and autonomy for student learners without sacrificing accountability. Through the process of contract development, students and teachers develop a means of communication and collaboration, resulting in a mutual pursuit of the learning experiences and outcomes. They are particularly helpful in field-based projects. Contracts also allow for flexibility to adjust the activities to accommodate the learner's style or particular strengths while still addressing identified objectives or outcomes. The following format encourages clear and explicit objectives (Knowles, 1991):

Learner: ______________

What are you going to learn/produce? (Objective)	How are you going to learn it? (Resources and strategies)	Target date for completion	How are you going to know that you learned it/succeeded? (Evidence)	How are you going to prove that you learned it/succeed? (Verification)

CONTRACT CHECKLIST

Students' Name										
Objective was expressed in operational terms										
Resource review of appropriate breadth and depth										
Timeline was realistic										
Effective presentation of evidence/verification of project success										

Environmental Skills Inventory

The following Environmental Skills Inventory includes a thorough list of criteria from which to pick and choose relevant criteria for your purposes. It might be more useful to use this checklist as a guideline for portfolio entries rather than a simple checklist. For example, students and teachers can decide what actions demonstrated these behaviors and determine how to document the occurrence of those behaviors in a portfolio.

Student Names

Criteria															
Identifies environmental issues															
Seeks historical background of issue															
Investigates environmental issues															
Separates opinion from fact															
Evaluates sources of information															
Analyzes environmental issues from various perspectives															
Applies ecological concepts to predicting probable ecological consequences															
Determines roles played by differing human beliefs and values in environmental issues															
Identifies alternative solutions															
Evaluates alternative solutions															
Conducts risk analysis															
Identifies and clarifies personal value positions															
Examines issues from local, national, regional and international points of view															
Demonstrates ability to forecast, to think ahead, plan															
Works cooperatively with other people															
Uses effective decision-making skills															

(modified from the Draft ASTM Standards, Alaska State Department of Education, 1993)

Authentic Products. When students engage in these meaningful activities, the most effective form of feedback is the public perception of the usefulness of their products. Therefore, any instructional strategy which encourages students to produce outcomes for public consumption also provides high incentives for the students to carefully edit and revise their products prior to completion. These activities are self-assessing in the most meaningful sense.

Scoring Scales

Criteria	1 No Evidence	2 Some evidence presented; still working on effectiveness	3 Effective demonstration of value to society	4 Exceptionally effective; still receiving applause
Did the project result in responsible action that was of value to society?				

Assessing Attitudes and Values

Much of the literature on environmental education refers to three domains: knowledge, attitude, and behavior. Many of the environmental education curriculum options include activities that promote an affective link to the environment ("Hug a Tree", "Adopt an Endangered Species", etc.). Do our students have a positive attitude towards ecological issues? Do they believe that they can be effective change agents? Do they value their relationship with the natural world? These attitudinal indicators provide important information to teachers as we plan instruction.

The following list of affective indicators of attitude and value development can be used in a variety of ways to document attitude change in students. These criteria reflect a student's sense of responsibility for the resolution of environmental issues, a respect for both nature and society, and a sense of efficacy in resolution skills. Teachers would probably only use a few of these criteria in a checklist, or they might use these criteria as guidelines for choosing items to include in a portfolio.

ENVIRONMENTAL ATTITUDE INVENTORY

Criteria															
Motivation to actively participate in environmental improvement programs															
Takes into account historical perspectives while focusing on current and potential environmental situation															
Strong internal locus of control															
Recognition of impacts of personal behavior, acceptance of personal responsibility for the impacts and willingness to help correct or avoid negative impacts															
Balancing love of nature with love of humanity															
Willingness to curtail some individual short term privileges for long range public good															
Respecting diversity of human perception, learning styles and value systems															

(modified from the Draft ASTM Standards, Alaska State Department of Education, 1993)

Strategic Documentation for Summative Purposes

The above assessment issues serve the purpose of informing instruction. They keep the teacher updated on the immediate schema and skill level of each student so that the teacher may continuously modify and manage the learning environment for best results. However, in the real world we need to provide additional information to administrators, program developers, parents and students about a number of norms. How do the outcomes of my instruction compare to the outcomes of other teachers? How does this student compare to the norm? How effective is this curriculum program compared to others? These summative and normative questions are a major purpose of assessment. They fall outside of the definition of authentic assessment in the service of instruction. However, educators are often called upon to provide documentation that answers these questions. How can we document some of the above authentic indicators of student ability in the course of instruction so that we don't need to dedicate our valuable time to non-instructional assessment? How do we decide which assessments to document and save? Finally, how do we contribute to more authentic forms of normative or standardized assessment procedures in environmental education?

Portfolios

A portfolio is a purposeful collection of student work that exhibits to the student and others the student's efforts, progress or achievement in a given area. Portfolios show what students know, not what they don't know. This collection should include:

- student participation in selection of portfolio content
- the criteria for selection
- the criteria for judging merit (if appropriate)
- evidence of student self-reflection

As teachers, we need to identify the purpose of the portfolio. It provides an opportunity to document and display student conceptual development for the summative and normative needs of administrators. If your district has a list of competencies and outcomes required of students, then it might be best to organize your portfolio around those criteria. Think about collecting material that documents individual growth in addition to comparing end results between students.

When designing portfolios, keep in mind their value at providing students the opportunity to display their own particular strengths in terms of learning styles or dominant intelligences. Think about how particular competencies might be demonstrated through musical, linguistic, mathematical, spatial, kinesthetic, or interpersonal models. Also strive to help students broaden their preferences and styles.

Putting it All Together: A Sample Unit on Habitat

Unit Abstract: Activities and Assessments

A simple example of a learning cycle model approach to an environmental education lesson follows. Assume that the teacher wants to address the concept of habitat, focusing on three sub-concepts: 1) habitat has four components (food, water, shelter, space), 2) habitat systems maintain their own system of checks and balances (all of the components are interdependent), and 3) natural disasters and human impacts can alter this natural balance. The following chart suggests an instructional sequence and some assessment considerations for each stage of instruction.

LCM Stage	**Assessment Purpose** The teacher wants to:	**Assessment Tools** Possible strategies
Engage The teacher will present the sensory awareness activity "Micro-Hike" from *Sharing Nature with Children*. In this activity the students carefully investigate 200 linear centimeters of ground and list their observations. This initial activity is followed by a concept mapping session on preconceptions about habitat ("What can you tell me about habitats?") or the construction of a "What We Know" Chart	Determine each student's preconceptions in order to provide effective multiple entry points for exploration. If necessary these documents can serve as baseline information from which to assess growth. Facilitate engagement (as each student needs to find some way of activating his/her current schema with the upcoming experiences).	The students list their observations and the teacher reviews these lists for initial observations of relationships between habitat components. Environmental Attitude Self-Assessment Concept maps about habitat preconceptions Prior Knowledge Charts
Explore and Discover The students experience three activities that reinforce the sub-concepts of habitat 1) "Oh Deer" from *Project Wild* is a simulation that results in a graph of deer population dynamics that boom and bust but recover as habitat components become limiting factors to population growth 2) "The Fallen Log" from *Project Learning Tree* is an investigation of a rotten log in which the students look for an animal and its necessary habitat components on that log 3) "Forest Consequences" from *Project Learning Tree* is a group project in which the students draw a forest on a mural and represent the effects of various developments on the habitats within that forest After each activity the students engage in either a discussion, journal session, or performance task card completion during which they verbalize their discoveries about habitat concepts	Determine the degree of conceptual change in the students (students illustrate this by creating concrete and verbal models of their schema). Determine if more explorations are necessary. Identify student-generated testable questions for inquiry-based experiments. Reinforce behaviors that elicit and respect alternative explanations and ways of knowing	Conceptual Change Rubrics Journals Discovered Principles Lists Prior Knowledge Charts Performance Tasks
Extend (Application and Empowerment) The students next engage in a role-play activity "To Zone or Not to Zone" from *Project Wild*. In this activity they assume a role of a particular interest group and represent that point of view in a mock trial about a proposed development This is followed by a moral dilemma activity "Ethi-Reasoning" from *Aquatic Wild* in which the students must decide how to respond to a proposed stream diversion that would affect the value of their property Finally, the students are challenged to design and complete an action project "Can Do" from *Project Wild* is an example of a lead in for such a project	Determine if the student can transfer the new understandings (either in a new context or in ways which benefit society). Facilitate new interests in students as they extend their original schema. (serves as "opener" instead of lesson "closure")	Points of View Scales Authentic Projects Rubric Taking Action Rubrics Learning Logs Contract Rubrics

The right hand column lists the possible assessment documents available for the activities. Most teachers collect this information informally for instructional purposes, and it is not necessary to document it all. Strategic choices on just what to document for summative purposes will result in a useful and efficient portfolio.

Samples for the Portfolio

HABITAT UNIT PORTFOLIO SELECTION GRID

Types of Assessments to Document and Display in a Portfolio	Specific Documents to Include (selected by student)
Evidence of conceptual change (preconceptions, postconceptions; details of conceptual mastery)	Prior Knowledge Chart on Habitat Analytical Trait Rubric on Habitat Concepts
Evidence of Cooperative Group and Consensus Building Skills	Points of View Likert Rubric
Evidence of concept application and personal empowerment	Taking Action Likert
	Reflection Questions on each of above

Summary

In summary, as educators we are under great pressure to maximize our effective use of instructional time. We are placing greater emphasis on acquiring continuous updates on our students' individual conceptual schemas. To be effective, we must collect this information informally and act upon it immediately in the classroom, but we should also consider ways to document it for other purposes. We need to be innovative in this endeavor, maximizing our data collection while minimizing our paperwork and the time we commit to it.

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Ecological Economics--A Framework for Integrating Environment and Economy

Sandra Koskoff, ISEE Publications Coordinator, Solomons, MD
Jim Zucchetto, National Academy of Sciences, Washington, DC
Martin Ogle, Manager Potomac Overlook Park, Arlington, VA

This session, conducted by members of the International Society for Ecological Economics, explored the subject of Ecological Economics, presented an example of an ecological economics approach to local sustainability, and explored with participants possible implications for curriculum development at the academic and K-12 levels.

Presenters first attempted to define the new transdisciplinary study of ecological economics and engaged participants in trying to articulate a definition. The ensuing discussion evoked the same disagreements frequently voiced within the membership of ISEE, because the membership includes economists, ecologists, and a wide variety of social and biological scientists. Participants objected to labeling economists' vision of the future as "optimistic" and ecologists' vision of the future as "pessimistic", noting that these characterizations tend to polarize rather than encourage consensus building.

Ecological Economics was described by presenters as a transdisciplinary field that attempts to go beyond traditional ecology or economics, avoid being restricted to a particular analytic scheme, seek new evaluation approaches, seek sustainable designs of nature and humanity, recognizes constraints on economic growth, and try to introduce nonmonetary contributions from nature. Conventional economic theories of value involving price, supply, demand, and quantity were compared with ecological economic theories of value in which the natural world has intrinsic value and contributions from natural systems are values. The conventional economic theory of growth (involving growth of GNP or assets over time) was compared to an ecological economic model showing economic systems increase and natural systems decline over time. The disciplines of conventional economics, conventional ecology, and ecological economics were then analyzed according to basic world view; time frame , space frame, and species frame of system evolution; primary macro and micro goals; assumptions about technical progress; and academic stance. Presenters acknowledged the fields of thermodynamics, geography, technology, engineering, and resource planning as subsets of the ecological economics approach, and attempted to distinguish between the domains of "conventional economics," "environmental economics and environmental impact analysis," "resource economics and environmental impact analysis," and "conventional ecology."

Participants heard an example of how this transdisciplinary perspective is being implemented through a community sustainability effort in Arlington, VA. Martin Ogle outlined his involvement with Arlington's community sustainability project that has drawn upon the resources of citizens, representatives from the local business community and from government, and members of NGOs to establish sustainability goals and an achievable program to assure quality of life for future generations.

In the afternoon, participants were challenged to suggest implications of the ecological economics approach for curriculum development at the academic and secondary levels. Jim Zucchetto first outlined the following possible approaches to a K-12 curriculum:

- Introduce examples into existing courses (e.g., biology, chemistry, geography, social studies)
- Introduce ecology courses as minimum
- Frame special studies form the top down (e.g., identify major problems and teach the student whatever is needed to analyze and propose solutions)
- Organize schools around the eco-eco concept (a "great problems" approach) where students identify and solve problems, learn basic disciplines, and apply knowledge as needed to human/nature sustainability.

There are problems of scale that need to be considered when designing such a curriculum: natural and human systems are too large to study and experiment with. Computer simulation and interactive learning would be required for such an interdisciplinary study, and worldwide communications would also seem mandatory to provide global understanding and sharing. Can present education frameworks really expand enough to address these problems?

In brainstorming sessions participants assumed that ecological economics would become a widely accepted approach to solving environmental problems in the future and were asked to describe skills and abilities, and contributions an individual trained in this "new discipline" could be expected to deliver. They were to describe a possible body of knowledge (understandings, concepts) and suggest activities and curriculum material that would best bring about this understanding. Participants were also asked to suggest ways of dealing with the problems of transdisciplinary instruction and ways of training current and future teachers to provide instruction in ecological economics.

The group addressing the interface between K-12 education and ecological economics envisioned K-12 instruction incorporating the following eco-eco concepts and understandings:

- Capacity to perceive and interpret the health of our world and then take appropriate action
- Understand the consequences and costs of whatever values they are developing
- Ability to work in teams and do research and see these as civic responsibilities
- Confidence in one's own ability to understand and explore the world
- Ability to identify basic needs or life and how we achieve balance and how that affects others

They recommended development of the following skills and abilities in teaching an ecological economics approach:

- Ability to compare human situations with situations in nature
- Perception that everything is interconnected--there is no free lunch
- Understanding and practice of ecological economics approaches in day-to-day activities
- Cultivation of both scientific and human skills (do we need more emphasis on science?)
- Encourage development of specialty while preserving ability and appreciation for working across disciplines
- Synthesis of ecological and economic understanding with critical thinking to affect practical solutions
- Appreciation for transition in culture
- Ability to popularize "hard" sciences--communication skills with a variety of audiences
- Development and appreciation of a vision that draws people together
- Ability to deal with real-world aspects of population and per capita consumption

Suggested curriculum activities could focus on:

- Investing in the future
- Creating and using alternative technology
- Developing environmental awareness through consumer education
- Developing cost analysis of products--real costs, including environmental costs
- Creating exercises where students interact with family (home environmental survey, interviews)
- Having students design or invent something giving consideration to environmental impacts and true costs
- Developing models for living and practicing sustainability
- Examining values, resolving conflicts between beliefs, values and actions, and making decisions on the personal and collective level
- Examining religious and spiritual traditions

The group addressing the interface between higher education and ecological economics made the following observations regarding academic instruction:

- At the college level, students should be trained to think differently, which results in integration of ecology and economics
- Academic instruction should teach effective communication, and respect for and command of diverse jargon
- Instruction should occur from the systems point-of-view
- Producing interdisciplinary students is difficult at the university level due to structural problems
- There are also problems matching multidisciplinary students with jobs. There are positions, but everyone wants experience--employers are not willing to take highly trained but unproven professional. There is a lack of acceptance of multidisciplinary degrees by students and parents. Higher education is expensive, and they don't want to take a change on financing a degreed student who can't find work.

These problems should be addressed as follows:

- Market the interdisciplinary students to corporations, institution, government
- Establish entrepreneurial efforts within higher education institutions to create interdisciplinary department and faculties
- Identify the roles for ecological economists in government, business, education cooperative education, internships

- Reestablish work/study programs to demonstrate the capabilities of interdisciplinary students
- Work on local issues in the area of the school as part of the education process
- Look for integrated courses that may already exist, e.g., cultural ecology
- Investigate various disciplines in the context of a critique or a problem to look for or at logical leaps and conflicts
- At the graduate level, provide experience in project management, budget skills, general people skills--human resource management

This group suggested that an individual working as an ecological economist should be able to function as a:

- facilitator
- coordinator
- person who understands, but is not an expert in many knowledge bases
- planner
- researcher
- person who understands and recommends high ethical standards
- public administrator who understands the political process
- person who appreciates the historical perspective
- mediator, able to resolve conflict and reach consensus
- person who retains a desire for lifelong learning, possesses an educated curiosity
- problem solver, able to synthesize information for effective decision making
- agent of change
- critical thinker, and one who is able to teach this approach to others
- visionary thinker

Modes of instruction at the college level might include integrated teaching from a faculty member with multidisciplinary background or segments in traditional courses of study with integrated problem-solving exercises.

Approaches to the course of study might (1) have students get a traditional liberal arts or science degree with a fifth year devoted to unification of an ecological economic perspective, (2) relinquish the disciplinary point-of-view in favor of multidisciplinary study, (3) have students obtain a degree in business administration with a minor in environmental or ecological studies, or (4) structure the entire curriculum around a "great problems" (like great books) approach to study.

Participants urged ISEE to (1) define the discipline even though there is a tendency to resist the confinement of a "specific label," (2) produce a clearly defined philosophy for the approach and the field, thus enabling clear policy statements to become increasingly influential, and (3) develop a serious program for producing and marketing curriculum materials at all levels, particularly on sustainability (as other countries are already doing).

III. SYMPOSIA

III. Symposia

A number of symposia were offered throughout the conference focusing on major issues or topics of concern to a number of presenters and participants.

Symposium I: Threatened and Endangered Wildlife Species

"Fate of the Ferrets--A Landowner's Perspective"

Ken Blunt
Malta, Montana

I am a landowner in southern Phillips County where in 1994 the black-footed ferret is to be reintroduced in Montana.

Southern Phillips County is a relatively remote area in northern Montana, 56 miles south of town (Malta, Montana). But people do live there. In fact, more than ten families live within ten miles of me. Many are in the fourth generation of existence in the community.

Let me dispel the myth of the "rich rancher." Most of the ranchers in my neighborhood are low- to middle-income people with debt loads that would stagger your imagination. They are honest, hardworking, independent people who care about other people. Most visitors to our community are impressed with the friendliness of those who live there.

Sixty percent of the land within Southern Phillips County is managed by the federal government. As you might imagine, public land is a problem in my community. Nearly all the ranches in my area depend on these public lands for their operations. This federally managed land mostly contains lands soils too poor for agricultural production. The public land is best fit for growing range plants, it is home for many species of wildlife and provides forage for cattle from spring to fall.

The private land, which is the more productive land, is found down creek bottoms or on lands with better soils. The private land also supports a large share of the area's wildlife, which are attracted to the alfalfa meadows, croplands, and water.

The federal Bureau of Land Management manages much of the public land. BLM lands are managed by a multiple-use concept, whereby livestock-grazing, recreation, and wildlife are all part of the land-management picture.

As a BLM permittee--I lease BLM land to graze cattle--I'm charged with doing a good job of taking care of the land. But here is the ironic part of it all--there are a lot of prairie dogs in southern Phillips County. Our prairie dogs are the black-tailed variety. They live in very dense towns and clip and/or eat most all the vegetation where they live. This leaves the already thin soil unprotected from wind or water erosion.

Continuous removal of vegetation causes the perennial native plants to die and smaller, shorter-rooted annual weedy plants to take over. Again, this sets things up for erosion because of the lack of roots to hold the soil in place. The range in prairie dog towns is in very poor condition.

My BLM allotment went from almost no prairie dogs in 1973 to 12 percent in 1988. That means 12 acres out of every 100 was occupied by these little creatures. In 1980, many BLM permittees were concerned about the rapid spread of the prairie dogs and urged the BLM to provide some remedy. The result was a prairie dog management plan, but before it was implemented, black-footed ferrets were found in Wyoming.

The discovery of black-footed ferrets in Wyoming almost immediately changed the prairie-dog control picture hundreds of miles north in Montana because the Endangered Species Act requires federal agencies to protect habitat for species that are on the endangered species list. The once thought-to-be-extinct ferret suddenly became a big consideration in the management of my ranch.

All this led to a black-footed ferret reintroduction plan for south Phillips County. From the beginning, the U.S. Fish & Wildlife Service said that without landowner cooperation, a ferret reintroduction would not be possible.

At the first mention of black-footed ferrets, landowners were worried about living under the restrictions of the Endangered Species Act. They were very much not in favor of having ferrets brought in. Yet, even though the landowners were not in favor, the federal agencies pressed on. Due to the large amount of federal land in southern Phillips County, it appeared the ferret could be forced upon us.

We landowners and others in the community decided we better make the best of a bad situation, so we became actively involved in the formation of a reintroduction plan in cooperation with federal and state agencies. Our major concern was and remains prairie dog control.

The goal in becoming involved in the development of the Montana black-footed ferret recovery plan was to come up with something to allow for a certain level of prairie dogs yet assure us prairie dogs would not be allowed to spread uncontrolled.

We wondered how we could maintain good stewardship of the land since it would be impossible to maintain good range condition on a prairie dog town.

We went to a lot of meetings with all the federal and state agencies and other interested groups and I think we worked something out that everyone can live with. As landowners, we had little to gain with the exception of the promise of prairie dog control. What is at risk is our way of life, and what we've worked for many years.

Anytime you involve yourself with an endangered species you open yourself to all the restrictive sections of the Endangered Species Act. That is why we agreed to go along with the plan to reintroduce the ferret as a non-essential experimental population. The experimental designation gives us some relief from the full restrictions of the ESA and allows us to carry on with our lives and operations without a lot of major adjustments.

Still, we are dogged by the possibility that the agencies involved will change the rules in the middle of the game. We've been assured this won't happen, yet we are seeing things occur that make us uneasy. It was agreed that those involved with the plan would keep everyone informed of what was going on.

An outbreak of plague in our area has reduced some of the prairie dog towns this past year. Last spring, the U.S. Fish & Wildlife Service and the BLM decided to apply insecticide to nearly 4,000 acres of prairie dog towns to poison fleas in the reintroduction area. Plague is one of the few natural controls of prairie dogs. Fleas carry the plague so the insecticide dust was applied to attempt to stop the spread of the plague at the source--prairie dog borrows. It wasn't the action that bothered us most, it was the idea that action was taken without informing the people who live in the area.

One of the integral parts of the reintroduction plan was the continuation of the recreational shooting program on BLM lands. The shooting program may help control prairie dogs, and provides much needed funds to the local economies. Recently, after 10 years of promoting the program, the BLM indicated it may close off some towns to shooting.

The ferrets aren't even here yet, and already we are seeing federal agencies positioning themselves to change what was agreed upon.

Finally, I'd like to talk for a little bit about the Endangered Species Act. When congress adopted it, it was for a noble cause. It has been amended often and strictly interpreted by the courts to the point where I wonder if it's authority is far over and above what was originally intended. It's become a national controversy. Some say radical preservationists use it to lock up everything with no regard to the people affected. Others say people like me have no regard for our wild critters and must feel the full brunt of the Act.

Today, more and more people, on both sides of the issue, say the Act needs to be changed so that it works better for the species and the people.

One important change would be to develop some incentives so that people like me--people who will live side by side with the animals--would want to be involved in ferret recovery instead of being fearful of getting involved.

I'd like to close by saying that we, as landowners, have nothing at all against the black-footed ferret. If they eat a few prairie dogs, it would be fine with us. If it could be brought in without me having to radically change my way of life, I'd say bring it in tomorrow. Put it out on my own land.

We have worked hard to be good stewards of the land and have been very successful in improving the condition of our range. We have also been successful in helping to raise more wildlife than there has been in nearly a century. We have mountain plovers, burrowing owls, and all manner of song birds. Coyotes, badgers, foxes, deer, elk, antelope and more. And we have prairie dogs.

And it's hard to watch those prairie dogs destroy what you've worked so hard to improve, yet I know we must also realize that those prairie dogs are important to other wildlife species that live, like us, on the prairie.

The important thing is that we maintain a balance and approach everything with common sense.

Fate of the Ferret--The Past, Present and Uncertain Future of the Black-footed Ferret (*Mustela nigripes*)

Ron Stoneberg, MDFWP

Introduction

The black-footed ferret (*Mustela nigripes*) perhaps one of the rarest mammals in the world, is a 1.5 pound, secretive, nocturnal carnivore of the family Mustelidae (Honacki et al. 1982). This masked solitary weasel is dependent on the prairie dog (Cynomys spp.) for 90% of its diet and lives in prairie dog burrows for shelter (Campbell et al. 1987). Prairie dogs are semi-fossorial, diurnal rodents. The distribution of the black-footed ferret is described as sympatric with the prairie dog and its historic range is depicted from Canada into Texas (Anderson et al. 1986). Because the black-footed ferret is primarily nocturnal, little was known about its habits until a small population was studied between 1964 and 1974 in Mellette County, South Dakota. Before 1964 only sporadic reports from trappers, museum collectors and government agents told of the existence of the ferret (Anderson 1986).

History

Legislation

In 1967 the black-footed ferret was listed as an endangered species in the United States (Federal Register 32:4001, 11 March 1967). Realizing that increasingly rare animals like the ferret needed care, congress created the Endangered Species Conservation Act of 1969. Although this act recognized the need for enhancement of endangered species habitat, it did not provide for sufficient enforcement or funding (Schreiner 1973). In 1973 the Endangered Species Act was adopted into law to "provide a means whereby the ecosystems upon which endangered species and threatened species depend may be conserved." This act provided funding and most critically, law enforcement for all endangered species programs.

Wild Populations

The Mellette County, South Dakota, population was studied for nearly 11 years. Even though valuable natural history information was obtained, the population slowly disappeared. As the wild population began to vanish, captive breeding was unsuccessfully attempted at Patuxent Wildlife Research Center in Maryland. Searches for other ferret populations continued in vain until 1981, when a farm dog discovered a black-footed ferret near Meeteetse, Wyoming. A seemingly healthy population of ferrets lived within the prairie dog towns in the Meeteetse area. From 1981 to 1985 the free-ranging Meeteetse population was studied and more valuable information obtained. Two diseases were documented in the summer of 1985 within the Meeteetse prairie dog complex, sylvatic plague (Yersinia pestis), a flea-carried disease deadly to prairie dogs, and canine distemper, a common disease deadly to ferrets. By the winter of 1985, only 10 black-footed ferrets were known to exist (6 in captivity and 4 in the wild). Captive breeding and later reintroduction appeared to be the only hope to prevent extinction (Williams et al. 1988). The 6 captive ferrets failed to produce offspring but wild females produced some kits in the spring of 1986. During 1986 and early 1987 the last 12 wild animals were added to the captive population bringing the total to 18. Finally, in 1987 two of the 11 captured females produced 7 young. The captive adult population is now over 250 individuals housed at Sybille Wildlife Research facility, Henry Doorly Zoo, National Zoo's Conservation and Research Center, Colorado Springs Zoo, Louisville Zoo, Phoenix Zoo, and the Toronto Zoo.

Reintroductions

In 1991 and 1992 the first 2 reintroductions were conducted at Shirley Basin, Wyoming, where 139 ferrets were released into the wild (Biggins et al. 1993). Although some animals lived through the winter each year, overall survival was low. Tests conducted during the releases indicate that predation by coyotes (Canis latrans), badgers (Taxidea taxus) and other predators was high. The 1991 release indicated a predicted decline of 86% in 90 days for the Shirley Basin population compared to 17% for the original Meeteetse population (U.S. Fish and Wildlife Service Report 1992). In 1992, 10 of 39 radio-tagged animals were killed by predators within 18 days of release (Biggins et al 1993).

Dispersal away from the release site was a second problem discovered in reintroduced populations of ferrets. Wide variability in dispersal appears to be characteristic of captive born ferrets. In 1992, however, animals raised in prairie dog burrows within outdoor pens were retained in the release site at rates 4-6 times higher than cage-raised animals. Individuals that disperse far away from the release areas not only leave the best prairie dog habitat and expose themselves to predation, but are also lost to possible mates at a later date.

Problems Facing the Ferret

Genetic variability in the present black-footed ferret population is known to be low (O'Brien et al. 1989), and additional loss of variation is unavoidable during captive breeding and reintroduction. Only 8 of the 18 original animals captured at Meeteetse for the captive breeding program were thought to be unrelated enough to be considered genetic founders. Abnormal physical features (including webbed feet, kinked tails, short tails, and oddly formed teeth) have been seen in some captive-born animals, and may be evidence of genetic problems. Random changes may occur in captive populations in place of natural selection that tends to remove less fit animals in the wild and favor passing on beneficial adaptations. We may be producing more tractable and domestic ferrets, or animals that otherwise have adjusted readily to the new captive environment rather than to the life of "wild" ferrets.

Captivity can affect animals in other ways too. The unnatural cage environment may not provide stimuli necessary for development of critical behavioral skills, a topic that is receiving research attention. Learned skills are most sensitive to quality, quantity, and variety of stimuli present, but even largely genetically determined behaviors can be altered if a critical influence is absent.

Diseases are a significant threat to the ferret recovery program. The potential effect of canine distemper has been demonstrated. There is virtually no individual resistance to the disease, and the only available vaccine provides only short-term immunity and does not protect offspring (Carpenter et al. 1976). Plague in prairie dog populations could be equally serious, but little is known about the disease in the various species of prairie dogs or its direct effect on black-footed ferrets.

Although some potential reintroduction sites have been identified, the dependence of the ferret on prairie dogs has subjected it to dramatic reductions in available habitat. Past and ongoing prairie dog poisoning programs, conversion of prairie dog towns to agriculture or urban settings, and the introduction of a presumably imported disease (sylvatic plague) have reduced the prairie dog's geographic distribution 98% since the early 1900's (Marsh 1984). Unfortunately, nearly 130 other grassland animal species are associated with the prairie dog (Sharps and Uresk 1990), and may suffer declines related to the decline of prairie dogs.

The human dimensions of the ferret recovery program are as complex as any other facet. Philosophies and personalities of professionals working within the ferret program vary widely, and lively debates have been common. In our opinion, the following are some of the more important lessons emerging from the past 20 years of ferret efforts: (1) Avoid "putting all your eggs in one basket." Captive breeding and translocation of ferrets from the Meeteetse population should have begun earlier. Likewise, reintroductions need to be in various locations. (2) Don't "re-invent the wheel." In several cases involving both research of free-ranging ferrets and management of captive ferrets, too little attention was paid to failures and successes during the South Dakota and Patuxent work. (3) Resist "preservation paralysis." At Meeteetse, realization that the small ferret population might be the last in existence motivated a protectionist attitude that stifled aggressive management options or actions that were the only real means to achieve species recovery. Similarly, a commonly frustrating attitude seems to be "If we don't do anything, we can't do anything wrong. (4) Be aware of and address the concerns of all parties involved in endangered species recovery. Federal agencies are required by the Endangered Species Act to do everything they can to ensure the survival of the species. State agencies, communities and individuals may not agree with this. The need for discussion and understanding is of great importance.

Conclusion

The above discussion seems to emphasize negative points. That is not because we believe the ferret program stands little chance of success. Rather, identifying problems is the first step toward their solution, and re-examining mistakes should help us avoid repeating them, not only within the ferret program but with all endangered species. There has been a great deal of agency cooperation and teamwork in the ferret recovery effort. No single agency or group of individuals has the expertise or resources to be successful on its own. Within the ferret program there have been outstanding examples of cooperation in the private sector, including ranchers, conservation organizations, companies and zoos. We remain grateful to the many contributors for their support.

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Symposium II: Environmental Education Advocacy Symposium

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Introduction

According to Nancy Amidei of OMB (Office of Management and Budget) Watch, "advocacy is a way of seeing a need and finding a way to address it".[1] In the 1990s, the need for environmental education is universally acknowledged. Many people, throughout all walks of life, agree that there is, without question, a need to fully integrate environmental education into our formal education systems and into the informal education sector. Why? To save the planet, to facilitate educational reform, to prepare future generations to solve environmental problems that we can barely comprehend, to better meet the needs of a rapidly changing global economy: the reasons are as varied as the people who hold them. The role of EE advocates is to bring together the diverse groups who see the need for EE, and to establish policies and programs that will effectively meet this need.

During the late 1980's- early 1990's environmental education leaders have successfully advocated for comprehensive EE programs in a handful of states and many local communities across the country. These programs and the history of their development and implementation provide invaluable models for other states and local communities. All of these exemplary programs were achieved through grassroots organizing and advocacy approaches. Additionally, these state and local EE programs involve some combination of the following components:

State-Level Components

State EE Master Plans chart a course of action with specific recommendations for legislators, EE organizations, state agencies, business/industry, and others, to follow.

State EE Office and Staff are a practical "must" for the successful implementation of a comprehensive EE program. These offices and personnel may be based in the state education or natural resource agencies, or in the legislature. They are responsible for implementing EE legislation and programs, and typically report to an EE Board/Advisory Council. Many states have a full-time EE coordinator based in the education department with part-time EE positions in natural resource and other departments.

EE Interagency Committees provide the forum for interagency coordination of EE responsibilities and resources for greater impact. EE Interagency Committees are usually broad in composition and may include representatives from the natural resources, education, health services, transportation agencies, the office of the attorney general, the office of tourism and the state land department, among others.

State EE Board/Advisory Councils are established to oversee state EE programs such as the EE master plan and EE grants program, to evaluate the progress of the EE program overall, to set priorities for EE statewide, and to solicit funds for the EE program.

State Bylaw or Requirement for EE Instruction are rules set by the legislature or the state board of education establishing that EE be taught as part of, or alongside, existing subjects.

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[1] *So You Want to Make a Difference: Advocacy is the Key*, OMB Watch, 1991, page 2

Teacher In-Service EE Training programs, such as Project WILD and Project Learning Tree, help practicing teachers to become educated and confident with EE content and methods.

Pre-Service EE Teacher Training Requirements are certification rules that require that teacher candidates demonstrate EE competencies in areas such as ecological principles, natural resources and their conservation, people-environment interactions, energy in biological and physical systems, and EE methods (affective, cognitive and citizen action).

State EE Curriculum Planning Requirements includes environmental education in the school district standards. Each school board is required to develop a written, sequential K-12 curriculum plan for EE along with other subjects.

State EE Curriculum Guides are designed to help in the planning and implementation of school district EE curriculum. These tools discuss environmental education goals and subgoals, theoretical base, curriculum planning approaches, teaching strategies and evaluation.

EE Learner Outcomes are specific indicators from which to gauge students grasp of environmental knowledge, skills and attitudes. Some state education agencies have created EE outcomes that span the state's curriculum and are used in creating EE items for state assessments.

EE Literacy Assessments provide information on the environmental literacy of students and teachers. They can provide base line data which can be used to evaluate the effectiveness of state EE programs.

State EE Centers and Regional Offices assists educators through in-service courses in EE and consultation about EE curriculum plan development. EE centers also provide EE resources for teachers and work closely with the state education agency to monitor environmental education literacy among teachers and students as a result of EE programs/training.

EE Grants Programs disburse funds to local, regional and state EE projects. Individual awards range from $1000-$40,000, depending on the state, and are either awarded by EE staff or the EE Board. Grant programs are an important avenue for involving the private sector (through contributions) in the state EE program, and since most have matching funds requirements, actually raise dollars for EE.

EE Funding Mechanisms include money from fees (fishing license, etc.), pollution abatement fines-or an assessment on such fines, revenue from special automobile license plates, and other strategies. EE Trust Funds are an additional approach which allows government to segregate funds for EE programs.

State EE Associations with a membership of teachers, EE/nature center directors, college/university students, school administrators, media representatives, and others, are the state EE grassroots leadership, needed to keep state EE programs "on the ground". In addition to creating new EE initiatives and holding regular meetings/conferences, these organizations watch-dog the state EE program and are able to mobilize effectively behind EE legislation and candidates.

Local-Level Components

Local EE Advisory Councils/Boards oversee EE programs, raise funds, and set goals. These bodies are important entities for networking purposes at the local level.

Long-Range Plan for EE help the community to envision the role of environmental education in enhancing the quality of education/life for residents and improving the local area. Local land restoration, neighborhood beautification, economic development are examples of long-range goals, as are ideals such as preparing low income-minority youth to qualify for environmental science and natural resource higher education and job positions. From these big goals communities develop shorter term goals and programs.

Local EE Coordinator are sometimes hired by the school district in a full or half-time position, and sometimes hired by the local EE board through public/private funds that it has raised. Responsibilities may include integrating EE into school curriculum and teacher training, coordinating special programs, working with EE providers in the area around mutual programs, fundraising, and publicity.

Local EE Centers are physical sites for the delivery of EE locally. Physical EE centers might be based in school district offices, in buildings leased by state parks, or in donated buildings. Depending on the goals of the local EE board, EE centers have staff and EE resources for the integration of EE into the local school system, and for community EE programs.

School Board EE Policy. School boards may approve policies to include EE in scope and sequence plans, and/or to fund teacher release time, field trips, and EE programs. County commissions and city councils have also funded EE programs in some communities.

Local EE Curriculum. Teachers, EE and nature center staff, personnel from local offices of state agencies, university faculty and other qualified individuals develop curriculum guides, made up of lesson plans and teaching resources that draw on the local area. These lessons are highly effective for helping students to learn about their community and local environment and relationships to the state, national and global environment.

Integration of EE into Scope and Sequence Plan. Scope and sequence plans are district created guides for covering all required subject areas and competencies. They are typically broken down by grade level. Integrating EE into these plans helps teachers to understand where EE fits into their classroom curriculum and to plan their instruction.

Teacher In-Service Days Devoted to EE Training. For practicing teachers to become versed in environmental education content and methods, in-service training is invaluable. School districts that set aside in-service days for this purpose, will encourage teachers to get this training and apply it to their classrooms and students.

Release-Time for Teachers to Work on EE Curriculum Development. Here the school district provides a substitute for teachers allowing them to develop their own EE curriculum and to be involved in integrating EE into scope and sequence plans. EE consultants are sometimes hired to help teachers and administrators with these processes.

Public/Private Sources of Funding and In-Kind Contributions. The options are endless. Local EE advocates have raised funds through grant proposals, local businesses, and local fundraising events. State and federal agencies, university extension offices and conservation districts typically provide significant in-kind support. In some cases, land and buildings have been bequeathed to local EE programs through land trusts. Local civic organizations and churches provide meeting space and sometimes funds, in small amounts.

National EE Advocacy Effort

In order to highlight the achievements of model states and communities with comprehensive EE programs, and to assist other states and communities seeking to incorporate EE into their school systems, the NAAEE-EE Advocacy Committee was formed in 1990. The following year, the National Wildlife Federation and the University of Wisconsin-Stevens Point (UWSP) pooled resources to launch the *K-12 Environmental*

Education Initiatives Project at the UWSP. Funding was provided for an organizing handbook aimed at EE advocates, and the development of recommendations for a national implementation strategy to assist state and local EE advocacy efforts. A K-12 EE Initiatives National Advisory Council was established, made up of representatives of national environmental education, education, and conservation organizations, as well as practitioners and scholars in the EE field. Additional partnerships were later forged with the NAAEE-EE Affiliates Committee and federal agencies, notably, the U.S. EPA, and the U.S. Forest Service.

To date, the K-12 EE Initiatives Project, with the guidance and assistance of the NAAEE-EE Advocacy Committee and the K-12 EE Initiatives Project Advisory Council has completed, or is in the process of developing the following projects:

- EE Advocacy Symposium. A three day symposium for state, local and national EE organizers at the 1993 NAAEE Conference in Big Sky, Montana
- Model State EE Legislation. Comprehensive state EE legislation approved by the Council of State Governments and incorporated in the 1994 volume of Suggested State Legislation, published by the Council
- Promoting Environmental Education: An Organizing Handbook for EE Programs in Your State and Community. This handbook includes: sections on components of comprehensive state and local EE programs; grassroots organizing strategies to achieve these EE initiatives; and nine state and local in-depth case studies describing exemplary programs and how they came into being. Available December 1993
- The Demonstration States Program. Funding, consultation, resources and referral to states requesting national assistance. Planned for late 1993-1995
- Speakers Consultant's Bureau/Neighbor States Project. Experienced EE advocates, professional organizing and environmental education consultants will work with neighboring states, and will be available nationally, Fall 1993
- The EE Advocate Newsletter and Computer Networking, Winter 1993

Origins of the EE Advocacy Symposium

In December 1992, a survey was mailed to 250 environmental education leaders throughout the U.S. to determine the needs and interests of individuals and organizations wishing to develop EE initiatives. The EE leaders were requested to comment on a proposed list of services for implementation by the K-12 EE Initiatives Project from 1993-1995. All respondents (60% return rate) commented favorably on the suggestion for an extensive symposium at the annual NAAEE conference. Furthermore, several respondents indicated topics that would be of particular use to them, including: how to lobby elected officials; mechanisms for funding EE legislation and programs; appropriate ways for agency officials to promote EE; effective grassroots organizing techniques; and fundraising and administrative approaches for successful grassroots organizations. Several respondents also pointed to the need to address cross-cultural and public/private partnerships in a session of this scope.

The EE Advocacy Symposium was thus, based on the feedback received from the December 1992 survey. Altogether, 10 sessions ranging in length from 1 hour to one-half day, and three working lunches, were developed by the symposium coordinators and qualified volunteers from across the country. Each of the sessions, the session coordinators and presenters are listed below:

EE Advocacy Symposium Opening Session

Richard Wilke, Chair, the NAAEE-EE Advocacy Committee--Introduction
Abby Ruskey, EE Advocacy Symposium Coordinator--Symposium Offerings

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Panel: Partnerships for Environmental Education: The Key to Successful EE Initiatives

Gary San Julian, Vice President for Research and Education, The National Wildlife Federation (NWF). The Importance of Partnerships in Advancing EE: The NWF Commitment.

Brad Smith, Office of EE, U.S. Environmental Protection Agency. Federal Partnerships for EE.

Ralph Ponce deLeon, Corporate Vice President for Supply and Environmental Management, Motorola Corporation. Private Sector Involvement in Environmental Education Initiatives.

Fred Neidermeyer, President, Educational Development Specialists, Lakewood, California. Regional Public-Private Partnerships for EE.

Running-Grass, Director, Three Circles Center for Multi-Cultural Environmental Education, Sausalito, California. Cross-Cultural Partnerships for EE.

Agency Roles and Responsibilities as EE Advocates: Working Lunch

An informal working lunch discussion session. Participants examined the roles that local, state, provincial, or national agencies can or should take in advocating Environmental Education Initiatives. Outcomes included broader perspectives and new contacts.

Kerry Baldwin, Discussion Coordinator/Facilitator, Education Supervisor, Arizona Game and Fish

State Level Environmental Education Master Plans-An Overview of Four Successful Models

State EE master plans play an important role in the establishment, evaluation and expansion of EE programs. They are a valuable tool for EE advocates. This session featured a panel of representatives from four states with successful EE master plans in place. Plans selected range from recent efforts to time tested models. Each panel member provided an overview of the developmental process, plan outline, implementation success, and merits and liabilities of their model. A brief question and answer period followed the presentations.

Kerry Baldwin Coordinator/Facilitator, Education Supervisor, Arizona Game and Fish
Bill Hammond, EE Consultant, The Natural Context (Florida)
Barbara Toren, Chair, Minnesota Environmental Education Advisory Board
Tanya Oznowich, Supervisor Environmental Educ., NJ Dept. of Environmental Protection and Energy

How to Work With State Government Officials to Achieve EE Initiatives

This session provided participants with the opportunity to master the tools, strategies and methods for turning good ideas for state environmental education into a state law. State and national policy makers, who have fought the fights and negotiated the tough compromises associated with enacting successful state environmental education legislation, were featured. Speakers analyzed the cooperation and collaboration among the numerous state-level agencies that is necessary to achieve, implement and enhance state level EE initiatives, recounted effective methods for winning over state legislators, and outlined the networks and outreach opportunities to state-level environmental educators, available through NAAEE's State Affiliates Committee.

Karen Armstrong-Cummings, Coordinator/Facilitator, Director of Administration, Kentucky Natural Resources and Environmental Protection Cabinet
Stan Gruszynski, Wisconsin State Representative
George Kirkpatrick, Florida State Senator
David Wicks, Chair of NAAEE's State Affiliates Committee.

Dollars and Sense for Funding State Level EE Programs: Mechanisms that Work

We live in an era of budget cutbacks amidst increasing demands from both the federal and local levels for state action in environmental protection and education. Given this scenario, states are finding it difficult to establish, maintain, or expand their environmental education programs. However, examples do exist of states that have established funding mechanisms to support their EE programs. Featured panelists discussed legislation, funding sources, administration, and oversight of funds and foundations for EE initiatives.

Karen Marshall, Coordinator/Facilitator, Research Assoc., Council of State Governments, Lexington, KY

Paul Zeph, EE Coordinator, PA Parks and Forestry Office, Pennsylvania's New Environmental Education Fund

Marilyn Baker, Exec. Director, OH Environmental Education Fund, Ohio Environmental Protection Agency, Funding Environmental Education Programs from State Pollution Fines

Gary Heath, Environmental Education Specialist, Maryland Department of Education, Environmental Education Trust Funds: The Chesapeake Bay Trust

George Kirkpatrick, Florida State Senator, Environmental Education Funding From Fees, Synthesis of session presentations.

Exploring Multi-Cultural/Urban Environmental Education: Definitions and Practice

Interest in Multi-Cultural/Urban Environmental Education is growing across North America. The session featured speakers from the field of Multi-Cultural Education and the Environmental Justice Movement, directors of multi-cultural environmental education programs, and national leaders in the field of environmental education. Panelists from these movements interacted with each other, the environmental education practitioners, and the audience, to explore the current meaning of, practices in, and possibilities for Multi-Cultural/Urban Environmental Education. This all-morning session was developed in partnership with the National Consortium for Environmental Education and Training (NCEET).

Part I: Environmental Justice and Multi-Cultural/Urban EE

Paul Nowak, Facilitator, Director of the National Consortium for Environmental Education and Training (NCEET), School of Natural Resources, University of Michigan-Ann Arbor

Liam Downey, Session Co-Coordinator, NCEET, The Environmental Justice Movement and Urban EE

Grace Boggs, Community Activist, The Detroit Summer and Save Our Son's and Daughter's programs, The Contribution of Youth Service to the Environmental Education of Individuals and Communities

Talbert Spence, Chair, Education Department, American Museum of Natural History, Creating a Common Language Between Different Organizations for Multi-Cultural/Urban EE

Running-Grass, Director, Three Circles Ctr. for Multi-Cultural Env'l Ed., Sausalito, CA, Tapping into Cultural Imagination in the Conception, Dev't and Implementation of EE Programs and Curricula

Part II: Roundtable Discussion

Running-Grass, Session Co-Coordinator/Facilitator, Director, Three Circles Center for Multi-Cultural Environmental Education, Sausalito, California

Roy Beeler, Supervisor, the Jersey City, NJ, Joint Activities (Multicultural EE) Program

Jean Fredrickson, Graduate student, Claremont Graduate School, Claremont, California

Kathy James, Professor, Department of Recreation and Leisure, California State University-Long Beach

Lori Mann, Education Director, Coyote Point Museum for EE, San Mateo California

Gina Wilson, Coordinator, EARTH TOMORROW: An Urban Challenge, National Wildlife Federation

Implementing EE Legislation: State EE Coordinators/Consultants Working Lunch

Participants discussed the challenging position of EE Coordinator/Consultant/Specialist in charge of implementing state EE initiatives. Outcomes included broader perspectives and new contacts. Interest in annual meetings for professional development was discussed.

Madeline Strong, Coordinator/Facilitator, Executive Director, Florida Advisory Council on Environmental Education

The "Nuts and Bolts" of Grassroots Organizing

Identifying goals for organizing; individual and group roles; issue development; developing a campaign; running productive meetings; keeping EE advocacy organizations going; and coalition building were all covered in the first part of this session. Participants also leaned how to develop a media message, how to establish a working relationship with reporters and how to interest them in EE advocacy stories. Session presenters also provided a brief overview of the wise use movement which has threatened EE achievements in at least one state.

Mary Hanley, Coordinator/Facilitator, Vice President of Public Affairs, The Wilderness Society

Sandy McIntyre, Grassroots Coordinator, The Wilderness Society

Local-level EE Initiatives: In a Class of Their Own

Leaders of local EE programs described their model EE programs, discussed the process that resulted in the establishment of these programs, and provide suggestions to the audience. The programs featured primarily impact K-12 students and are offered by local school districts in partnership with local non-profit organizations as well as business entities.

Gary San Julian, Facilitator, V. P. for Research and Education, the National Wildlife Federation

JoAnn Roberts, Coordinator, CHESPAX, the Calvert County, MD environmental education program

Roy Beeler, Supervisor, the Jersey City, NJ, Joint Activity Program

Ann Cunningham and Katherine Costello, Heron Lake Environmental Learning Center, Southwestern Minnesota

Amahra Hicks, Manager, U.S. Forest Service Commencement 2000 Multi-cultural Environmental Education Program, Oakland, Sacramento and Fresno, California

Judy Baldwin, Director of Curriculum/Staff Development and Coordinator of EECo (Environmental Education Cooperative), Custer County, SD

Financial Planning for State and Local EE Advocacy Organizations: Money is great, but a terrific plan and money is incomparable!

This session provided participants with a highly organized method for successfully planning a fundraising strategy. Research issues, talent searches, how to set plan goals, time tables and accountability methods were all covered. Additional ideas for balance sheets, evaluation processes and fundraising resources, were also presented.

Beki Glyde Brandborg, Fundraising Consultant, Helena, Montana

Local EE Coordinators and School Administrators: Box Lunch

Local EE Coordinators, School Principals, District Superintendents and Curriculum Coordinators, teachers, and other administrators of local environmental education programs were invited to this lunch discussion.

JoAnn Roberts, Discussion Coordinator/Facilitator, EE Coordinator, CHESPAX, the Calvert County, MD environmental education program.

Education Reform and the Role of EE Learner Outcomes

A major component of the education reform movement that states are currently addressing involves the development of student learner outcomes. How is environmental education fitting into this educational effort? This session showcased various state efforts that are tying environmental education to learner outcomes.

Dennis Yockers, Coordinator/Facilitator, EE Consultant, Wisconsin Department of Public Instruction
Kathleen Shea Abrams, Director, Office of EE, Florida Department of Education
Kristina Allen, EE Consultant, Arizona Department of Education
Pam Landers, EE Consultant, Minnesota Department of Education
Gary Heath, EE Consultant, Maryland Department of Education

NAAEE-EE Advocacy Committee Meeting/Symposium Closing

The EE Advocacy Symposium was evaluated. Representatives from states and local communities were asked to report on strategies for environmental education advocacy that were developed or refined as a result of the symposium. Future projects of the NAAEE-EE Advocacy Committee and the K-12 EE Initiatives Project were discussed including: the Demonstration States Project; a national network and a speakers/ consultants bureau; a national EE advocacy newsletter. The recommendations of the participants at the Local EE Coordinators working lunch regarding state-level EE advocacy symposia, were also discussed.

Richard Wilke, Facilitator, Chair, NAAEE-EE Advocacy Committee

Follow-up to EE Advocacy Symposium

The positive response to the EE Advocacy Symposium at the NAAEE conference signified the commitment of state, local and national EE leaders to make EE advocacy a priority during the 1990's and into the 21st century. Many excellent suggestions were provided by symposium participants for future symposia and EE advocacy workshops. As a result of these suggestions, the K-12 EE Initiatives Project has submitted a grant proposal to the EPA to enhance services to states. Specifically, we are hoping to receive funding in order to compile the symposium video and audio tapes, the **Promoting EE** handbook, and other resources into a package for states. These packages will be designed to guide EE leaders in conducting their own state-level EE symposium. The packages will initially be available to states who qualify for the demonstration states program and later made available to all states.

Symposium III: Out of the Field, and into the Fray of Government-The Challenge of Bringing Environmental Studies into Active Partnership with Political and Governmental Processes

Sally Cole-Misch, International Joint Commission, Windsor, Ontario
Zygmunt Plater, Boston College Law School
James Goetz, Esq., Montana State University, Bozeman, MT

A Paradox

A troubling paradox emerged from the lively discussions that took place in this symposium. The symposium addressed the questions:

- "How can (and should?) environmental studies programs actively enter the fray of public policy and social governance?"
- And if such participation is legitimate, how should EE provide skills for effective environmental citizen action?"

In the course of the symposium, both in the official session and especially in the extensive corridor discussions that followed it, the paradox emerged from the parenthetical question noted above, which grew to take over somewhat the symposium's planned agenda. Here is a sampling of conflicting comments drawn from the symposium discussion that illustrates the paradox:

"Some environmentalists don't know how to be heard in the political process. They make more enemies than friends the way they lash out. But if environmentalists know how [to present their positions in the political process], they can be very effective."

"Environmental education seems more comfortable looking at endangered critters up close than stepping back and talking about what is killing them in the first place--because what is killing endangered species is often politically controversial habitat destruction."

"I don't see why we should talk about opposing government agencies or industries; the subject of this symposium is supposed to be *partnership*."

"Look around this conference. What does it mean to have EE being sponsored by mining companies, chemical companies, and government agencies that have lousy environmental records?"

"A lot of us in EE feel that we can't get involved in public policy debates, because then we'll lose our scientific credibility."

"We are training students to know a lot of things, but not how to present their knowledge where it can make a difference."

"If citizens like many of us in EE don't get heard, then no one is going to make some of these important points [about the broad ecological consequences and risks of various projects and programs]."

"It is risky to get out ahead on any controversial issue."

The symposium originally evolved from conversations with Professor Bill Stapp of the University of Michigan's School of Natural Resources and Environment. There are, Bill noted, three major functions of Environmental Education:

- Information (the development of data and learning in all areas of environmental sciences),
- Values (the development of ethical positions and policy principles), and
- Implementation, or Governance (putting the first two to work in our private and public decision making systems).

Unfortunately, Professor Stapp said, most environmental studies programs spend virtually all of their time on the first two functional areas. For whatever reasons, often relatively little attention is paid to putting our environmental information and values to work at a societal or governmental level.

So the symposium was designed to address the available opportunities for public policy involvement, and how to teach effective participation skills. The background question--whether EE should get involved in the first place--became an active part of the dialogue as well.

Here are the two different perspectives that emerged:

- On one hand the presenters and a number of speakers in the audience described and emphasized the importance of environmentally-educated citizens playing an active role in public policy debates--in the community, the press, agencies, legislatures, and courts. Environmental citizens can be instrumental in projecting environmental values and factual analyses, sometimes as partners with government, and sometimes as adversarial intervenors opposing government agencies and industries that are attempting to by-pass environmental considerations. The upshot of this first perspective is that EE has an important role to play in public policy controversies, and should do more to train citizens on how to be effective in the public forum.

- On the other hand the opposite perspective was strongly voiced by some members of the audience, who expressed great hesitation about getting involved in any public controversies. The job of EE was rather to try to work in partnership with government and industry, not in opposition to them. When EE takes positions critical of official government agencies or industry, it loses its scientific credibility which depends on "neutrality." Teaching public communications skills is fine, but activism is not an appropriate mode for EE educators to follow. We should stay away from controversy, although our students, of course, are free to take on whatever citizen crusades they may wish.

These two different perspectives clearly mark out an important debate which has been stirring beneath the surface of EE discussions over past years, perhaps since the beginning of EE. Active involvement in the contending factual and policy analyses of public policy debates--or efforts to teach public policy advocacy skills for projecting environmental analyses into ongoing controversies--have been rather rare in the course of EE's evolution over the years.

Why is this? In part it may be lack of an available curriculum. (The chair was pleased to remind the audience of the new environmental law coursebook discussed at the last EE conference--Plater, et al., Environmental Law and Policy: Nature Law and Society, West Publishing 1992, which offers a comprehensive study of environmental issues in the legal system and administrative process.)

In part it might be a function of the perceived demands of "scientific neutrality," as some audience members held (although one audience member argued that "playing ostrich is the opposite of neutrality"), or of the stigma and opprobrium that can come from being perceived as critical of the status quo. In part it might indeed be the result of political co-optation, as one audience member asserted, ("Look at who is sponsoring these conferences lately. And we are all going to Cancun next year.") But whatever the reason, it clearly is not because citizen participation is not important.

The three formal presentations underscored that fact:

The first speaker, Sally Cole-Misch, spoke about the experience of the International Joint Commission, an international research, investigative, and advisory body focusing on Canadian-U.S. transboundary environmental issues. (See summary of remarks of Sally Cole-Misch, in *Presentation Summaries* below.) In the recent debate about toxics in the Great Lakes watersheds, the initial reluctance of politically-appointed commissioners to acknowledge the importance of toxics in the Great Lakes was overcome by extensive public participation in IJC public hearings. A parade of environmental citizens, some scientifically-trained and some not, built an impressive body of information technical and otherwise that changed the official position of the Commission and led to strong IJC recommendations for the restriction and control of toxics. Because the IJC had not announced a firm decision refusing to acknowledge the toxics problem, in these public discussions citizens generally played the role of persuasive *allies*, exhorting the official participants to understand and acknowledge environmental consequences, rather than adversarial confrontation.

The second speaker, Zygmunt Plater who teaches Environmental Law at Boston College Law School, discussed cases where citizens had been forced to participate as *adversaries* to official decisionmakers. His formal presentation focused on the endangered species cases involving the Snail Darter and the Northern Spotted Owl. The snail darter functioned as a sensitive biological indicator of the ecological and economic values in a region's last major stretch of flowing river, which would be destroyed by a TVA recreational dam. The spotted owl has been the focal point for debates about the ecological consequences, economic subsidies, and controversies associated with Forest Service/timber industry programs for clearcutting the last of the Pacific Northwest old-growth forests. In both cases the government agencies and private industry participants had firmly decided to proceed on a course of resource exploitation that bypassed economic and ecological analysis and violated several Federal statutes. The citizen outsiders failed in attempts to discuss and negotiate, and faced with the official players' intractability ultimately had to go to court to enforce the law. In conversations after the formal presentation, Plater discussed the Alaska Oil Spill, where commercial fishermen were the active allies with government and industry to facilitate the clean-up of the Exxon-Valdez disaster, and thereafter were brought in as part of the official supervisory system for oil transport.

The third speaker James Goetz, who has taught Environmental Law and Policy at Montana State University and is a prominent member of the Montana bar, told about several water resource controversies in Montana over past years. In the case of the U.S. Army Corps of Engineers Libby Reregulating Dam, the story again involved a federal agency and an industry bloc comprised of large water users associations. The plan was to build a surge-control dam structure that would eliminate more than seven miles of free flowing river and the ecological qualities it contained, in order to provide a technological solution to the scour consequences of upstream dam operation. The citizens argued that more sensitive ecological planning for the operation of the up-stream dams could accomplish the same management results at much lower cost without the sacrifice of so much of the free flowing river, and noted that a variety of federal laws were violated by the project as proposed. The official players in the coalition pushing the dam would not discuss environmental issues with the citizens, and again they had to go to court to assert their position. In court proceedings the testimony of environmentally trained field personnel--hydrologists and resource economists who bravely volunteered to testify for the citizens--led to a defeat of the proposal on its shaky merits.

Retrospective *Abstract* of the Symposium

Reviewing the course of the symposium and the issues that arose, the Chair was reminded of where we've come since Rachel Carson. Carson triggered a broad scientific and social recognition that the status quo was not adequately taking account of the real life consequences of human activity--industry was overlooking the resource depletion and pollution costs it imposed on its human and ecological communities, and government agencies were too often oblivious as well. The job of environmentalism--and Rachel Carson and the budding environmental movement were savagely castigated by the status quo for doing it--has been to point out the comprehensive necessity of taking account of the consequences. The revelation of environmentalism is that a society cannot afford to ignore all of the interrelated short and long term ecological and economic effects of human decisions, and as much as possible must try to bring all of those considerations into policy decisions. Societal decisions that look broadly and deeply at consequences before a decision is made are going to be more rational, and make that society far more survivable and prosperous, than decisions which ignore the ecological reality and focus only on short term net benefits to the decision makers. Only by incorporating consideration of important ecological and economic concerns would human governing decisions be able to achieve a sustainable partnership between the earth and its humans.

Over time, citizen environmentalists have provided a critically important voice. From Love Canal to the spotted owl it has been citizens who have raised the important issues that had to be discussed in the public debate, not the official government agencies nor the corporate players involved.

In many cases it seems that the most significant role of environmentally-trained citizens has been in active opposition to official positions. Citizen support for environmentally sound initiatives by government and industry is fine, but the official players in the status quo don't really need citizen help; the "establishment" does a pretty powerful job of communicating its positions on its own. Understandably, however, where official decisionmakers don't want to acknowledge the negatives of their actions, it requires the voices of outsiders, going against the grain, to make the real balance of costs and benefits public. Acid rain, wetlands loss, radioactivity discharges, contaminated pharmaceuticals, long-term pesticides, and on and on--in all these cases it was outsiders who had to push the official players to acknowledge that they existed and were problems that society had to face.

It does seem, moreover, that EE has tended to avoid teaching the skills of pointed, critical policy analysis and public forum communication in some of today's most important resource debates. Where is EE... when HydroQuebec plans to dam a virgin river for power that conservation would make unnecessary, at the cost of endangered species and Native American cultures; when a nuclear power plant is built on an earthquake fault; when federal timber, grazing, and mining policies are called into question in the spotted owl and other Sagebrush Rebellion controversies as subsidized giveaways and resource destruction; when the "wise use" movement argues for resource privatization free from environmental regulation; in the pitched debates over environmental quality protections in NAFTA... where is EE? From a glance at our annual conference topics and at our curriculum materials, it seems that too often EE just isn't there (perhaps leaving it up to EE graduates joining citizen environmental organizations, who learn their public policy skills on the job). If this is true it is unfortunate, undercutting EE's potentially important societal role.

Inevitably environmentally-informed citizens must play an active role in the governance of their society, or important public policy debates will be narrowed and constrained by the official players in the status quo. The long term rationality of human development requires citizens who are able, if necessary, to say that the emperor is not wearing clothes. The emperor needs such people about, though he doesn't necessarily enjoy their message.

Ultimately, it seemed that the majority of the symposium audience, as all three speakers, felt that environmental education should focus attempts to make citizens more effective participants in official policy debates, as necessary to present the important perceptions of environmental analysis, whether that meant opposition to official players or alliance in particular situations. Reluctance to take a position because it might be controversial, a majority seemed to feel, is an obstacle to realization of the important role that environmentally-educated citizens should play in facing the complexities of modern technology and the requirements of our natural environment.

Presentation Summaries

1. Sally Cole-Misch, Director of Public Affairs, International Joint Commission, 100 Ouellete Avenue, Eighth Floor, Windsor, Ontario N9A 6T3, (519) 257-6733 or (313) 226-2170

[The International Joint Commission, or IJC, is a treaty organization established between the United States and Canada in 1909 as a conflict resolution body. The Commission's role is to prevent and resolve disputes between the two countries concerning boundary waters. Boards, councils and other advisory bodies are established with top experts from various fields to assist the Commission in studying these issues, reaching conclusions, and making recommendations to both governments to resolve and act on these issues. Commissioners are chosen by the Prime Minister in Canada and the President of the U.S., with the advice and consent of Congress. Over the years, appointments have become largely political, primarily attorneys. While appointees are generally intelligent and well-versed in a variety of areas, few arrive at the Commission with much awareness or interest in boundary waters issues. The Commission's responsibilities in the Great Lakes region includes monitoring progress by Canada and the United States to accomplish the goals of the Great Lakes Water Quality Agreement, which the two countries signed in 1972 and renewed in 1978 and 1987, and providing an extensive information and consultation program for the residents of the region. In addition to publishing information materials and technical reports, creating an extensive education program and developing a roundtable consultation process, the Commission holds Biennial Meetings on Great Lakes Water Quality to bring together all interested sectors of the Great Lakes community.]

More than 600 citizens, governmental representatives, scientists and environmental activists participated in the International Joint Commission's 1987 Biennial Meeting on Great Lakes Water Quality to learn about and discuss issues facing the lakes, and the status of progress by the two countries to accomplish the goals of the Great Lakes Water Quality Agreement. In 1989, more than 1,000 people participated in the meeting, and almost 2,000 joined the Commission for its meeting in 1993. These numbers reflect the increased level of awareness and activism throughout the region for Great Lakes protection efforts.

For the first time at the 1989 meeting, the Commission invited the public to testify through a formal hearing process. More than six hours and 180 speakers later, the Commissioners came to understand the extreme level of frustration, fear and anger the public, scientists and environmental activists felt about Great Lakes protection efforts. In particular, various researchers pointed to the increasing evidence of a link between persistent toxic chemicals in the Great Lakes ecosystem and deformities and other abnormalities in various species in the region, including humans.

More than their advisory boards' findings or any other presented information, this outpouring of statistics and concern led to the Commission releasing a Fifth Biennial Report on Great Lakes Water Quality that was vastly different than previous reports and recommendations to governments. The Commission concluded in its report that "there is a threat to the health of our children emanating from our exposure to persistent toxic substances, even at very low ambient levels... What we have failed to realize is that what we are doing to the Great Lakes, we are doing to ourselves and to our children."

As evidence has continued to mount to document this link--including a human health study of developmental problems in children born to women who consumed large quantities of Lake Michigan fish contaminated with PCBs, increased deformities in offspring of birds, mink and otter, decreased sperm counts in men, and high levels of PCBs in women with breast cancer--and as more and more citizens and scientists have expressed their concerns and findings to the Commission in subsequent biennial meetings, the Commission has continued to recommend drastic actions by both countries to eliminate persistent toxic substances from the Great Lakes ecosystem. Their recommendations have been founded not only on sound scientific data, but also on the concerns, findings and realities of thousands of citizens who have impacted by persistent toxics in the environment.

How have these citizens and scientists provided such a convincing argument to the Commission? Certain consistent characteristics of effective interactions have emerged over time between and among Commissioners, policymakers, scientists and the public. From these, at least seven lessons can be gleaned for environmental educators to help others--and themselves--interact with and influence policymakers:

- The information you present must be scientifically credible, with certainties and uncertainties clearly outlined. Those who presented statistics to back up their concerns and strong feelings, when they testified before the Commission, were listened to carefully. Those who expressed concerns with emotion, but without facts, were not as successful, even though their concerns were listened to and even responded to with caring and sympathy.
- Assume trust vs. mistrust until proven otherwise. We all respond more positively to others who treat us with respect and courtesy; policymakers are no different.
- Coordinate your efforts with others who can provide the statistical information to back up your case, and work with them to create change. The influence of the American Association of Retired Persons in Washington is an obvious example of how organizations with active memberships can effect change. The NAAEE could have the same impact on educational policies, if it activated its members.
- At the same time, the opposite is also true: one person CAN make a difference. One scientist has continually presented information credibly and with emotion, and her impact on Commissioners has been significant.
- When you interact with policymakers, deal with emotions versus emotionality. Consider Sarah Brady, wife of James Brady, who was shot in the head during the Reagan administration: she presents her story with strength and emotion, but not emotionality. She remains credible because she uses her life experiences, as well as facts, to make her points. A personal story, presented in a straightforward way, can help others to understand your motivation; we all like to know what drives or motivates others to take certain actions. Don't be afraid to share your life experiences, as long as you can present them with honesty and composure.
- Many--if not most--policymakers, i.e. politicians, are attorneys by training. Consider their language and try to use it in advocacy work. Likewise, many environmental agency representatives have a scientific background, and will most understand positions presented in terminology they are familiar with. Remember, too, that environmental protection efforts to date--and thus the responsible institutions--focus on managing pollution, rather than eliminating or preventing it. This is beginning to change, but it is a daunting challenge to perspectives and programs for many who have worked at these agencies for years, or even decades.
- Finally, we need to take these lessons and the philosophy of environmental education to heart in how we teach and interact with others: provide the best and more accurate information we can, interact with respect, encourage collective action with personal responsibility, and help learners to develop the ability to understand all aspects of an issue--the scientific, political, economic and social.

Environmental educators can play significant roles in political and governmental processes, by participating in and helping others to understand the variety of ways we can positively impact the world we live in.

2. Zygmunt J.B. Plater, Boston College Law School

The Tellico Dam case study involved the last of TVA ps more than five dozen dams, planned to flood the last 33 flowing miles of clean running river left in the region. The dam was too small for electric generators, so it was justified by an economic argument for recreational development and the development of a hypothetical model industrial city. The citizens tried to negotiate with TVA on the merits of the project, noting that the projects benefits were far outweighed by its economic and ecological costs, an opinion supported by all economist and ecologists that didn't work for TVA. After successfully halting the dam for violations of the National Environmental Policy Act, the project was stopped again when violations of the Endangered Species Act were discovered. The endangered snail darter fish, *Percina imostoma tanasi*, had once lived throughout the Tennessee River system, but had been killed off by dams, population-by-population, until it faced extinction with the loss of the last stretch of flowing river habitat. The citizens ultimately took the case to the Supreme Court and to congressional and administrative agency oversight hearings which established the economic weakness of the dam project and showed that an environmentally sensitive alternative--development of the river without a dam--would save the public millions of dollars as well as saving the river. The river and most of the species remnant population were subsequently lost, however, when Howard Baker pushed through a late night amendment that overrode the economic and environmental analysis and ordered the dam to be finished. (See Plater, "In the Wake of the Snail Darter...," Journal of Law Reform, Vol. 19 pp. 805-862, 1986).

In subsequent comments Plater also talked about the Spotted Owl controversy and the Exxon Valdez Oil Spill, and both of which cases he and his students had acted as consultants.

In the controversy involving the Northern Spotted Owl, *Strix occidentalis caurina*, the endangered species again served as a fragile barometer--a "canary in coal mine"--of economic and natural values to humans as well. The clearcutting of the last old growth forests jeopardized salmon harvests by increasing sedimentation in streams, produced desolate stretches of denuded mountainside where the public previously had deep forest environments available for multiple uses, and involved the transfer of millions of dollars worth of subsidies to timber industry to fund the destruction of this last public forest resource. It was environmental citizens who built the broad economic analysis that showed that endangered species protection makes overall economic sense as well.

Likewise in the Exxon Valdez oil case, it was the environmentally-trained citizens, some of whom lived along the shores of Prince William Sound, who had predicted the disaster before it happened, and who knew best how to respond to it when it occurred. Drawing upon the conclusions of the Alaska Oil Spill Commission for which he had worked, Plater discussed the way in which an active informed citizen group could be factored into resource management decision system. The previous exclusion of concerned, informed, environmentally-aware citizens from the oil transport process had been a major reason why safety precautions to prevent a disaster had not been effective, and response preparations failed to cope with the oil spill once it occurred. After the disaster, the state of Alaska, the federal government, and the Alyeska Oil Consortium set up citizen oversight councils designed to assure that concerned citizens, who would not become complacent as the official players had been prior to the Alaska disaster, would be involved in the long term management of the oil transport system.

Symposium VI: Integrating Adult Education Principles into National Environmental Programs for Employees and Citizens

Elaine Andrews, University of Wisconsin Coop. Extension
Anne Camozzi, ECOLOGIC, Nova Scotia

Description

This symposium provided an opportunity for exchange of ideas about strategies and techniques best suited for improving employee and citizen concern about the environment. Case studies outlined national programs from both Canada and the United States. This session was developed in response to a need expressed at the 1991 NAAEE conference in St. Paul, Minnesota, where a one day preconference workshop identified a large number of NAAEE members who are extremely interested in learning more about how to integrate adult education principles into an environmental education program. An adult environmental education network has formed and has been strengthened through a second workshop at Eco-Ed in Toronto, 1992 and subsequent communication.

The first half of the session featured case studies of national employee and citizen education programs. Case studies included citizen, industry, community and environmental professional efforts. Representatives from invited organizations provided presentations about their programs. The second half of the session focused on key questions about these and other programs, such as: what education strategies are most successful; how can these be evaluated; and how can we better facilitate exchange of information and ideas about adult programming? Participants helped to clarify and define successful techniques in adult environmental education.

Objectives Of This Conference Session

Overall goal:

- Improve adult decision making about the environment

Sub goals:

- Improve level of knowledge by professionals of national adult environmental education program
  -what is the role of national programs?
  -how do national programs meet the needs expressed by our overall goal
- Review steps of adult education programming
- Collect and record ideas on how to integrate environmental education into adult education opportunities
- Networking among environmental education professionals
- Learn more about support needs for adult environmental education professionals

Panel topics:

- Why was the program developed?
- How did the planning take place?
- Who is your audience?
- What is the basic design of the program?
- How is the program implemented?
- How is the program evaluated?

Environmental Issues Forums

Environmental Issues Forums (EIF) is a program of the North American Association for Environmental Education (NAAEE). Initiated in 1992, EIF offers a discussion-based approach to adult education on environmental issues. EIF currently makes available discussion materials on solid waste and wetlands issues. In the works are materials that focus on water quality and biodiversity, with more issues to come.

Why was EIF developed?

In 1991, NAAEE released its organizational long-range plan. The plan was shaped by extensive consultation with members and others concerned with environmental education. This process of hashing out the long-range plan revealed--among other things--a striking gap in environmental education programming for adults that is participatory as much as it is informational, and that focuses on critical environmental issues.

As NAAEE's membership grows, the Association is putting more effort into developing its own programs. NAAEE's leadership saw in the need for issue-based programming for adults an opportunity to make a unique contribution to the field.

How did the planning for EIF take place?

Coincidental with the development of the long-range plan, NAAEE began exploratory discussions with the Charles F. Kettering Foundation. The Kettering Foundation, an operating foundation that researches and develops programs for improving citizen involvement in politics, is the driving force behind the National Issues Forums. The National Issues Forums is a widely used program of citizen discussion of political issues, became the model for the Environmental Issues Forums.

These explorations with staff members from the Kettering Foundation helped the NAAEE participants firm up their vision of the educational program they wished to create. In keeping with the ideals of environmental education and the spirit of the National Issues Forums, they committed themselves to a program that helps people:

- explore various points of view and policy options;
- gain basic knowledge about the issue;
- understand the dilemmas at the heart of the issue; and
- talk together about where they agree and disagree, and what kind of action is desirable and possible.

From its membership, NAAEE put together a team of several people to work with the Kettering foundation on two fronts. The first was to learn to develop materials like those that are used in the National Issues Forums. The second was to plan the details of the EIF program. Program planning, then, combined the environmental education expertise of NAAEE members and the citizen education knowledge of Kettering Foundation staff.

Who is the audience for EIF?

The Environmental Issues Forums aim to reach a broad audience of adults and older students (middle school age and up). The materials are designed to be engaging and substantive enough to be suitable for citizen discussions as well as for use in classrooms. The discussion guides are applicable in both the United States and Canada.

What is the basic design of EIF program?

Environmental Issues Forums materials provide a structure for public dialogue. The introduction of each issue book describes the issue and provides basic information necessary to understanding it. At the heart of the issue book are three or four different perspectives on the issue. Each perspective is built on a unique view of the problem and offers a distinct remedy. Options for policy and individual and community action, stories, maps, graphs, and photos clarify these perspectives.

These perspectives, or "choices", are the framework for discussions led by a moderator whose role it is to challenge participants to explore their own points of view more fully and to understand other perspectives. EIF is designed so that people are encouraged to implement and adapt it as they see fit, setting their own goals for its use. Some users choose to focus closely on the text of the issue book, using its structure to assure that participants understand the perspectives as they are written. Others use the perspectives presented in the books as a starting point for a discussion that focuses on exploring and clarifying the values and points of view of participants.

How is the EIF program implemented?

NAAEE makes available for purchase the issue books, a condensed version of each book called an "Issue in Brief," and a "Moderator's Guide" that offers tips for setting up, publicizing, and running Environmental Issues Forums. A program coordinator at NAAEE headquarters provides information and support for potential program users.

While program goals are set by individual users, NAAEE offers general guidelines for using the EIF program. A key guideline is that a skilled and fair moderator is necessary to the success of the forum discussion. Thus far, orientation to EIF and training for moderators has been available at NAAEE preconference workshops, and from some individuals who have gone through these workshops. To provide additional training at the local level, NAAEE is working out a cooperative arrangement with some individuals who have provided training for the National Issues Forums.

How is EIF evaluated?

Evaluation takes place or is planned on three levels; materials development, participant knowledge and opinions, and programmatic. Issue books are developed using interviews, small group research, and expert review to assure that they are accurate and will engage citizens. Pre- and post-forum surveys enable NAAEE to gather substantive information about perspectives on the issues, and they provide a tool that may be used in the future as part of an effort to assess forums' impact on attitudes. These provide some feedback on the forum process, and further programmatic evaluation is in the planning stages.

Motorola Environmental Awareness Training Project

I. Corporate Training Vision

- Change agent
- Support corporate initiatives
- Enhance competitive advantage
- Provide common language
- Provide consistent message

II. Program Design System

- Requirements gathering
- Global analysis
- Global design
- Develop materials
- Development test
- Pilot test
- Release of materials
- Instructor certification
- Continuous review and renewal
- Program maintenance

III. Environmental Training Project History

- Environmental council identifies leadership strategy-awareness training needed
- Course specs developed
- Motorola University develops project plan
- University of Wisconsin-Madison selected
- Awareness course completed
- Train The Trainer courses begin
- Delivery begins-U.S.
- Translation begins-9 languages
- Delivery begins-Asia/PAC and Europe

IV. Program Implementation

- Target population is all motorolans
- Conduct Train The Trainers in all regions
- Delivery administered by local training sites and MU
- class size 25 to 30 students
  700 classes estimated for Phoenix
  400 classes estimated for Austin
  700 classes estimated for remaining U.S

V. Train The Trainer Courses Completed

- 100 trainers certified, worldwide

VI. Program Evaluation

- Level I Evaluation-(participation Satisfaction)
- Level II Assessment-(test for understanding)
- MU course quality metric graph

VII. Protecting our Environment Outline

- Nature of environmental problems
- Testing your environmental awareness
  Stratospheric ozone
  Ground level ozone
  Global climate change
- Regulations
- Motorola's environmental game plan
- Pollution prevention
- Integration with six sigma

Global Action And Information Network: Educating And Informing People To Act

The Global Action and Information Network (GAIN) is a clearing house and network service for people taking action for sustainable development and environmental protection. GAIN provides reliable and current information on a variety of sustainability issues to encourage and support people taking action. To do this, it operates as a true network. GAIN gathers and gleans the best and most relevant materials from a wide range of respected sources. It then compiles and disseminates this information in a timely manner--and in an easy-to-use format. Members choose how they receive GAIN materials--printed or on diskette via U.S. mail, or electronically via electronic mail.

GAIN provides its members:

- A free subscription to Gaining Ground, a journal for people taking action, featuring success stories, legislative updates, action alerts, resources, and ideas. (three issues per year.)
- A free subscription to the GAIN Packet, featuring the best of what has been posted on computer networks, legislative information, action alerts, feedback forms, and ideas for sustainable living. (Three packets per year, mailed between journals.)
- Access to GAIN's evolving resource and referral service.

GAIN also posts information on America Online and EcoNet to provide:

- Up-to-the minute news on bills in Congress
- Background data and analysis on legislation
- Action alerts
- Organizational resources
- Addresses and phone numbers of Congress members, cabinet officials, and other agencies

GAIN's emphasis has been on legislative information, including up-to-the minute news on bills in Congress as well as background data and analysis, action alerts, success stories about actions on a variety of issues from wetlands protection to environmentally friendly transportation, ideas for what you can do, organizational resources, and more. In addition to this emphasis GAIN has several projects in the pipeline or in their early stages, including:

- The Sustainable Transportation and Energy Project (STEP)
- A Database of Successful Approaches to Sustainable Development
- A Comprehensive, National Directory of Environmental Activist and Education Organizations
- The Sustainable Lifestyle Program (SLP)

I will emphasize today the Sustainable Lifestyle Program because in it we are combining what we have learned about what is needed to support and encourage action. Also, a central part of SLP is an evaluation or feedback process for GAIN and for the people taking part in SLP that will let GAIN learn more about how to provide our services or education and how the participants can evaluate their own change and action. The most basic elements of SLP occur in a repeating cycle of assessment, goal setting, and action. GAIN provides SLP participants with support to keep them moving through these cycles.

Our present context is one in which fundamental change is needed in all arenas ranging from our personal actions to the actions of multi-national corporations if we are to make substantial progress towards living sustainably on the earth. People must be supported in new ways so that they will take the largest action steps that they are capable of and so that they will keep acting for substantial change. While there is both a large population in the U.S. that identifies itself as environmentally concerned and a wealth of high quality information to inform actions, there are still only a relatively few people who are acting to bring about the needed change.

The primary goal of SLP is to encourage and support action by individual citizens to protect the environment and create a sustainable future by matching people with action information most appropriate to them and by giving them the human support they need for a long-term commitment. GAIN will engage people in a personal way and offer them options for individual action and for joining the wider community of activists. To that end, we are creating a new kind of service, intended to help people live more lightly on the earth, reduce their personal impact on the natural environment, and take whatever positive actions they can to encourage broader political and social changes.

Perhaps as important as the action part of this project is its evaluation component. This component provides feedback for the overall project to inform continual improvements to make it increasingly effective. The evaluation will also address the question of whether the program is making a difference in producing meaningful change. Finally, the evaluation method that we are employing can be replicated and adapted by other social and political change organizations so that they can determine if their programs are really making a difference.

SLP is designed to give people all the information and support they need to make a difference through action in their own lives. When they join SLP, people will "weigh in" by responding to a set of questions which will give them an objective measurement of how lightly or heavily they live on the earth. From that point on they will determine what they want to do to become lighter. SLP will provide them the necessary support to meet their objectives. SLP is intended to make the process of change, being lighter on the earth, fund and rewarding so that people will stick with the program and realize its full benefits. Most importantly, SLP will not be just another set of "things you can do" that is offered without follow-up or support. Rather, at the heart of the program will be an active, sustained partnership between GAIN and the individual members in which we will continue to provide information, assistance, and moral support for as long as people wish to continue participating. Our goal is to provide people with a situation that is safe, non-threatening, and fun within which they may realize their full potential as global citizens.

People will be able to join SLP through various computer networks such as Internet, EcoNet, and American Online as well as through regular mail. Most informational aspects of SLP will be administered by computer, with some aspects handled via regular mail. Computers are particularly efficient for disseminating information and for sending suggestions and communications to individual members. These features make it possible to administer a personalized service without participants having a travel to a centralization. This greatly reduces the costs of running of a program such as SLP, and greatly expands its potential reach and impact

An effective program of personal action and change must provide people with the information and support they require, and help them sustain their long-term motivation. SLP will provide people with relevant, high quality information to help them define and achieve their sustainability goals. This information will be presented within a program designed to be easy and entertaining, and that will help people achieve rapid change with a minimum of effort and frustration.

Finally, if we wish to be maximally effective in providing education for action, our actions must manifest what we are trying to teach. We must be kind with each other as we act to be kind to the earth. We must be acting to walk lighter on the earth.

Inform Program Background: Development And Planning

INFORM is conducting a series of pollution prevention workshops in the Great Lakes region designed to train local citizen and labor leaders on how to promote pollution prevention/source reduction at plants in their communities.

The Problem

INFORM's analysis of the 1988 US EPA Toxics Release Inventory Data indicated that, on a per county basis, the 72 U.S. counties that border directly on the Great Lakes had TRI reporting facilities that released or transferred an average of 8 million pounds of toxic waste per county, almost three times the national, as well as Midwest average of 3 million pounds per county. Although these are only about 3 percent of the counties in the nation, they accounted for 9 percent of the country's total TRI releases.

The challenge facing citizens in the region was in developing a program of action that would respond to the data. Local groups were powerfully motivated to see the toxic released reduced or eliminated, but they lacked skills and resources to do so. They needed help in researching local plants and to assess steps plants could take to reduce toxics use, hazardous waste generation, environmental emissions, and workplace exposures to toxic chemicals.

Workshops

INFORM's pollution prevention workshops are designed to help address the information needs of local citizen and labor groups, helping them to negotiate effectively for pollution prevention efforts at industrial facilities.

The workshop series is now taking place in each of the Great Lakes states and in Canada. The workshops train local citizen and labor groups, using our 1993 publication Preventing Industrial Toxic Hazards: A Community Guide to analyze, publicize and promote solutions to local or regional plant pollution problems. The workshop in each state builds in INFORM's research of specific state concerns as well as our expertise in pollution prevention strategies. Thus far, we have completed workshops in Wisconsin, Illinois, Ohio, Minnesota and Michigan. The next two are scheduled in October, in Pennsylvania and Indiana, followed by Canada and New York in December and January, respectively. We have designed, publicized and conducted in workshops in collaboration with groups in the region working to reduce toxic discharges effecting the Great Lakes. Each workshop is followed by continued INFORM assistance in response to groups' needs.

Workshop Audience

The workshop audience consists of environmental, citizen and labor leaders.

Design of the Program

The workshop is designed to train citizens on the concept of source reduction (see Chapters 1-3); how to conduct background research on a local plant, (using information from a number of publicly available databases (see Chapter 5, Worksheets 1-9); and how to meet with officials in local plants (see Chapter 5, Preparing for the Plant Interview, Worksheets 10-11, and Chapter 4.)

We allot ample time for questions. In addition, while the workshops vary from state to state, depending upon the local need, we often have panel discussions on success stories, and/or discussions on mistakes made in the past in dealing with local plants. We have also done "role playing" wherein we stage an actual plant meeting and members of the audience play the role of community members, while workshop leaders assume the role of plant officials.

Program Implementation

The workshops are conducted in each of the Great Lakes states and Canada. The Workshops are usually day-long with two ten minute breads and an hour for lunch. Often we have a lunch speaker who generally talks about local organizing efforts or other related local issues.

Program Evaluation

The program is evaluated by the participants on a workshop evaluation form provided by us in the packet of workshop materials.

National Program Case Study Simulation

Some Issues to Think About

The following is a fictional case study based on several different programs and experiences. The issues an problems this case study raises are characteristic of the many of the concerns surrounding the development of national programs.

The Eco-Green National Training Program (fictional)

The Eco-Green National Training program was developed in Canada to be a national training program to educate environmental educators about adult education principles and practices. It was initiated by a national adult education organization based in Toronto, Canada. The national organization wanted to offer a summer institute at a location not far from Toronto. The institute would run for two weeks and teach participants about the principles and practices of adult education as they related to the field of environmental education.

The national organization consulted across the country with various educators and organizations to get feedback about the needs of educators and the possible design of the program. Generally, this feedback supported the development of a program but people felt:

- It should not be based in central Canada due to the cost of travel and because too many programs were already based there. Travel was also not considered to be environmentally friendly
- Similar regional programs had already been developed which had the same general objectives and people were worried about re-inventing the wheel
- People had a strong sense of "regional" ownership and wanted to keep training programs in their region. They had a real mistrust of the national organizers
- People felt that the money allocated to the program could be better spent on a distance education package or multi-media training module that could be brought to the regions easily. Travel money, for example, could be put into programming instead of "expensive central Canada extravagances"
- People were worried that a "national curriculum" would be too generic and not specific--they recommended a national core program with specific regional adaptations
- People from the regions felt that the national organization underestimated their level of expertise and experience.

Organizers from the national education organization felt that these views were valid but that their reasons for a central summer institute were stronger. These reasons were:

- They felt that people from all different regions would benefit from face-to-face interchange and exchange. This "face-to-face" experience is a cornerstone of why they feel so insistent about a national institute
- They felt that several national institutes were necessary to bring regional coordinators "up-to-speed" so they could return to the regions and train others
- They generally felt that being in central Canada (in its most populated region) gave them a perspective about needs which were more accurate
- They were concerned about "losing control" of the project and having objectives blurred if it went out to the regions
- They were concerned about their funding source which clearly funded a national program
- They had no expertise in distance education but proven experience in summer institutes and knew they could carry out this kind of program successfully.

How are these issues resolved?

What are the pros and cons of national programs?

How can Eco-Green do to resolve these problems?

How does adult education theory help to contribute a solution to the problems and differences of opinion?

What would you do if you were the executive director of Eco-Green?

Notes from small group discussions

#1. Pros

Organization structure
Quality-continuity
National resources
Get regions together to work, learn, common vision
National outcomes
More credibility organization structure
Continuity of quality
Available natural resources
Getting the regions together
Common vision
Enables national
Help understand the process
Less resource itemize
Less duplication
More cost effective
Easier to find

#1. Cons

Constituency weak in national
Participation lower, malicious compliance
Not the grass roots

Too generic/application/relevancy
Loss in program more in travel
People may opt out
Time to develop longer, i.e. translation
May fail diversity of region and culture
May fail to get ownership from regions
Lack of regional input and possible alienation
More time to develop national program
Go along with but they'll sabotage it

#2. How can EcoGreen resolve these questions. What to do.

Start with existing programs
Needs assessment
Objectives
Strategies
Bring regional coordinators up to speed. Train The Trainer program
Regions participate to help formulate program
Back to the people for face to face with citizens
Funding practical to the regions

#3. How does adult education theory help to contribute a solution to the problems and differences of opinion?

Participants help plan
Process is participatory
Needs assessment with 3 levels
Build in evaluation
Sharing the results broadly

#4. What would you do if you were the executive director of Eco-Green?

Listen
Give some parameters concern
Empower people to do this
Build trust by listening, considering
Plan should have a regional component
Asking regions how to make it work
Bring in regional speakers for consultation-cross pollination
Inviting regional people to help design
National organizations act as link and facilitate
Three level needs assessment
Funding neutral to the regions
Team approach-go out to the regions
Identify and define regions
Identify existing regional structures
Explain rationale
Help staff training
Provide guidelines

A Brief Overview of Basic Adult Education Principles

Anne Camozzi
ECOLOGIC, Nova Scotia

Adults learn when they feel comfortable, respected, and when they're allowed to make mistakes. They also like and need to have some fun in the learning process. Learning is also enhanced when they have a distinct need to know something, when the content is meaningful and relevant, and when they can use their experience in the learning situation. Adults learn in many different ways and they should be allowed to learn in the way that suits them best in a format and process that is highly interactive and participatory. Adults also should be able to participate in the design and evaluation of programs.

Designing programs

The content should be appropriate to learner and organizational needs as well as relate to learner's job. Keep in mind that the elements of the program should be within the facilitator's range of competence and within the allotted resource. The agenda should be flexible; allowing time for changes and evaluation. Goals and format should be clear to participants and the learning environment should be comfortable always allowing time for climate-setting. Remember that successful design depends on knowing the needs of the participants and their organization. The following are the steps that should be done in program planning and design:

- Conduct a needs assessment. What do participants want and need? What does the organization want and need?
- Formulate objectives based on organizational and personal needs
- Design a program to fulfill objectives
- Implement the program
- Evaluate the program

Various Program Formats

- Individualized learning: home-study/correspondence course; self-directed learning projects
- Group learning: action projects, institutes, workshops, clinics, conferences, conventions, courses, large meetings, exhibits, fairs, festivals, trips and tours.

Some Educational Techniques

- Brainstorming/brainwriting
- Case study
- Role play
- Discussion/buzz groups
- Panel
- Interview

Participants wanting more information on theoretical matters were asked to refer to the Proceedings of the Nonformal Workshop held at the NAAEE conference in St. Paul (1991) which covers the above information in more detail.

Symposium VII: Bringing Multimedia to Environmental Education

Megan Crowley
Claypoint Productions

What are some creative multimedia partnerships that have been formed to develop, distribute and train teachers to use multimedia programs?

Earth Explorer began its work two years ago when we talked with various pioneers in educational software. In our discussions with *Jostens* and *National Geographic* we learned that they both considered teacher support and training the key issue for their school products. With *Jostens*, we discussed Compton's Encyclopedia, math, science and reading programs; with *National Geographic* we discussed KidsNet as well as their Presidents, Mammals, and Geography discs. The *Earth Explorer* project has learned from the experiences of both groups. That's why we relied heavily on teachers and kids in creating our product. We intend to continue to work closely with educators, and with Apple Computer, which is distributing the Encyclopedia. Apple understands teachers' real concerns about integrating interactive technology into the classroom.

Because we believe teachers know best what will work, we are testing *Earth Explorer* in real classroom situations. One of the teachers who contributed to the content and the presentation of materials--Steve Hoare, science teacher at the International School in Washington--is using *Earth Explorer* in his classroom this year (prior to its release) so we can better design the teacher's guide. During the project, five teachers were on staff either part- or full-time to create content, including infographics and thinking-skills games. Other teachers reviewed the material for age-appropriateness, creativity and approach, in line with current curriculum requirements, Project 2061, and other science/environmental education reform efforts. Their insight helped us focus the interactivity in short, manageable chunks.

Our teacher's guide will be a resource to help teachers use the encyclopedia and get up-to-date environmental information, gathered together in one easily accessible place, within and designed for middle schools students. Teachers are also helping to design the teacher's guide, of course, and through *Earth Explorer's* partnership with the University of California-Irvine, teachers will be the ones introducing the encyclopedia to classroom teachers in small training groups. These "teaching teams" will have a ripple effect as they head back to their districts.

Earth Explorer, along with its distributor Apple Computer, will target seven states and selected teachers in those states to learn the advantages of *Earth Explorer*. Because actually using a multimedia-media product is the best way to see its advantages, *Earth Explorer* may be able to make loaner copies available to a few districts in the US and Canada. In addition, *Earth Explorer* will be visible to key leaders such as Vice President Al Gore (whose chief of staff and his son have viewed the prototype), NEA and NSTA.

How can environmental educators and multimedia developers work together to create multimedia programs with relevant content and broad appeal?

They can be brought in more and more at the design phase. Environmental educators are most aware of what is already being used in the classroom--what works and what doesn't, where the content gaps are, what has failed and why, what succeeds with kids and how. This knowledge can be invaluable to the multimedia developer who lacks actual classroom experience.

Teachers must be in on the ground floor of planning and creating--not merely as reviewers or approvers but as an integral part of seeing if the concept and creativity "fit" the need as they see it. Teachers must be able to test the prototype of the product with their students in a hands-on learning situation.

A pressing need of multimedia developers is assistance from teachers in crafting environmental products that respond to the needs of students who are adept at reading, those for whom English is a second language, or those in inner city classrooms.

How can educators, developers, distributors, hardware and software producers work together to make equipment, multimedia programs and training more accessible to teachers and students?

Technology is more and more user friendly and less formidable as we move into the 21st century. This key fact will allow easy mastery of the machines and make valuable interactive teaching tools an everyday parts of a teacher's bag of tricks. Software producers and distributors need to make prototypes and training widely available, keeping in mind that timing and ease of use make all the difference in whether educators will ever know about a product--and actually use it. Distributors have to make a commitment to training and follow-up support.

Previewing the product at conferences such as NAAEE are a must, as well as regional meetings, gathers of other subject area teachers (such as NSTA), technology-related conferences such as NECC, and one-on-one with individual teachers at in-service meetings on the local level.

"Bundling" hardware and software give educators an advantage because it keeps costs low, gives an opportunity to use several products, and lessens the amount of time educators must spend previewing.

Producers and distributors could enlist the aid of reviewers/previewers and spread those results in a wider fashion before educators actually use the product. "User reviews."

Symposium IX: Global Briefings-Sustainable Development: More than EE?

Verne Howe, Southern Vermont College
Mary Paden, World Resources Institute

Verne Howe

Welcome to the third NAAEE Global Briefings Symposium. We will have three panels this morning with a discussion period, and our moderator will be Michele Perrault, who will be introducing the Symposium. Michele is currently the President of the Sierra Club, a member of the President's Council on Sustainable Development, and on the U.S. Environmental Protection Agency's National Advisory Council on Environmental Education.

Michele Perrault

I am going to give a brief overview of how this symposium came to be, some personal experiences that led me into this subject area, and something about the definition of sustainable development. Finally, I will tell you a little about the panels themselves.

A number of us working internationally, and also in environmental educational, have felt for a long time that the many efforts to integrate environment and development concerns in the international arena, needed to also be brought to the educational field. Particularly in the United States, we felt there was a lack of integration of environment and development education. We felt it was important to develop a framework that spanned these disciples and integrated these two subjects.

The history of efforts to bring together environment and development began in the international field. I think many of you are familiar with the Stockholm Conference in 1972 which dealt with environment, including human settlements. In 1983 the United Nations commissioned a study, the Brundtland Commission Report, reflecting five years of studying the burden that was being placed on the world's resources, and the problems of people living where the resources around them were depleted and unable to sustain their basic needs. This was happening particularly in the developing world.

In about 1985, the environment and development NGO communities including population NGOs, along with the help of the United Nations, recognized that they needed to join forces if they were going to make a difference on what was happening globally. They came together and wrote a joint environmental action plan, called Making Common Cause.

The Earth Summit was held in 1992 in Rio, Brazil. Focusing on the need for sustainable development, it brought together those concerned about environment and those working in development as well as people living in developing countries. It also pointed out the differences in understanding, not only between governments in the south and those in the north, but also among the non- governmental organizations.

If you join the efforts of those who are doing environment and development education, multi-cultural, population education, human rights and peace, together there will be a stronger group of people helping our citizens, young and old, move forward for a more sustainable world. I look forward to the dialogue here from our various panels who have some of the best people thinking about such integration. I have also been concerned, as an international activist, that United States citizens do not have a great understanding about what is happening in other parts of the world. For example, recent surveys showed that many U.S. students don't even know where Canada is, let alone have a sense of other people's lives around the globe. How can we ever fix the problems, or find solutions to them with such a lack of adequate education?

Out of Rio, came a focus back to the communities in the United States: a realization that the problems faced in the developing world exist in our own country as well, especially in minority communities. Why do we need the joining of educating forces for sustainable development? First, the conflicts between environment, economic and social pressures are so great, that they can alter the quality of life around the world and if we do not find some way to better educate, we will not be able to solve our problems. The skills required to take care of the Earth and to achieve an environmentally sustainable society are numerous. Our present institutions, decision making processes and lifestyles cannot assure viable systems for the present and future generations.

We need a significant shift in societal values for this vision of a sustainable future to survive. We need a work force trained to minimize the impacts of draining the world's resources. We need new skills to open dialogue with people of different perspectives. We need new interdisciplinary planning and decision-making and a new challenge to our present consumer lifestyles. We need a new sense of concern for equity and social justice and for diversity. All of these will require education of our young and old in how to dialogue with people of differing views. I think this was reflected in many of the sessions at this conference, particularly the symposiums that dealt with multi-cultural perspectives. No single area of education will do the job, at least in my opinion and in the opinion of others at this symposium.

We must devise an effective education approach for an environmentally sustainable world. We need to build on the existing efforts among all of the different kinds of educators, in whatever their field. I have had opportunities to look at the material being developed, not only in the environmental education area, but by global educators, and each one has components that the others could use for a better encompassing education framework. Through sustainable development we may globalize educational understandings to include such issues as trade, environmental security, and more equitable distribution of the use of resources worldwide. Through sustainable development and better dialogue, we may tie education to peoples' lives locally, in especially communities that are seeking new sustainable visions.

We can tie students into real applications where they live and on the things happening around the country. Thousands of Americans went to Rio; they have come back saying that they learned that the most important difference we can make is not somewhere in some other country, but here at home. If we can't be more sustainable in our own local communities, then we bear a heavier impact on the world globally.

I would like to move now to describe briefly our panels. Panel one will discuss the strands in education that could be woven together for sustainable development education. Panel two, will discuss case studies of how sustainable development education has been approached in several other countries (Canada, the United Kingdom, Mexico and Russia). It will focus on the power structure of the educational establishment in each country and talk about educational approaches that relate to the strands described in panel one. Panel three, will discuss the idea of developing a conceptual framework for U.S. sustainable development education and getting it integrated into the mainstream of United States education. I am going to introduce Verne Howe, who is Director of the Environmental Studies program at Southern Vermont College and also a former Board Member of NAAEE, and she will introduce the panels individually.

I want to talk a little bit about the term sustainable development. It is not a term that the Sierra Club, my organization, uses very much. We use the term "environmentally sustainable economies" or sometimes "sustainability." However, the term "sustainable development" is used in the international arena; it is also by the U.S. President's Council on Sustainable Development, which was created as a response to the Earth Summit.

At Rio, all nations agreed to create national mechanisms to respond to the blueprint of the Earth Summit, Agenda 21. On the day that the United Nations formed its Sustainable Development Commission, the United States formed its Sustainable Development Council. So we have this recognition nationally of sustainable development as a term. Some people prefer not to define it, but rather to state that they believe in the integration of the human element into the environment, in people's basic needs and their need for resource space if they are to survive. But with the understanding that you must do this within the constraints of the biological systems.

There was an article recently in Conservation News from the Conservation Fund that quoted an article in Scientific American which noted that "sustainable development," the most fashionable phrase in every grant or international loan application is still being defined. How that definition takes shape may determine whether sustainable development proves to be an oxymoron or the organizing concept for an enduring society.

President Clinton charged the President's Council to develop specific recommendations for national strategies for sustainable development. He defined development as meeting the needs of the present without compromising the future; the same kind of definition that came out of the Brundtland Report.

The article in Conservation News continued that however one defines sustainable development, society has little choice but to strive for it, and time will tell if true sustainability in any place, on any scale, can be obtained. I think that we have to move forward with the term.

There have been some comments by differing groups about the word "development." A document called "Educating for Global Change," published for a coalition called InterAction, which contains over 100 development groups, plus the Sierra Club and some other environmental groups, states confusing "development" with "growth," misperceives the problem as one of a world divided between poor and rich, instead of divided between underconsumers and overconsumers. Using the growth-oriented vision, we have not only denied our own responsibility as development people, but we have created the development industry based on the assumption that we can enable the poor to be rich. "An approach which is conceptually obsolete, politically naive and ecologically disastrous."

The Environmental Economics Association addresses the difference between growth and development, saying that growth refers to a quantitative increase in scale of the physical dimensions of the economy, whereas development referred to the qualitative improvement in structure and design. I think you can have economic progress without increased growth. If we can get people to have that sense of sustainable development, then development itself won't be a bad word.

Verne Howe

The first person to speak on this panel is Bora Simmons, who is the Associate Professor of Outdoor Environmental Education at Northern Illinois University. She is also a Member of the Board of NAAEE. Our second speaker is Thomas Keehn, Senior Consultant of the American Forum for Global Education, who for the past ten years has been the Director of Development Education for InterAction, a coalition of 150 United States NGOs involved in international development, relief and reconstruction. I am the third speaker. Our fourth speaker is Liam Downey, a graduate student at the University of Michigan, who is researching different ways in which to make urban environmental education more effective, and the implications of the environmental justice movement for environmental education. Marshall Case, our fifth speaker, is a wildlife education consultant, and former Senior Vice President of the National Audubon Society.

Bora Simmons

I have been given the task of giving a very brief overview of environmental education and to lay out a context for the rest of the speakers. If you look at environmental education it is possible to determine a number of starting points. Whether you consider environmental education's origin as being in the 1960s, or whether you trace environmental education's roots to nature studies, outdoor and conservation education, environmental education can boast a considerable history with a substantial set of accomplishments.

To give a better context of environmental education, however, I want to start with a generally accepted definition of environmental education: "The goal of environmental education is to develop a world population that is aware of and concerned about the environment and its associated problems, which has the knowledge, skills, attitudes, motivation and commitment to work individually and collectively towards solutions of current problems and the prevention of new ones."

The definition was developed during the UNESCO sponsored international workshop on environmental education held in Belgrade, Yugoslavia in 1975. It should be noted that this is a process-oriented definition; it starts with the concept that we are to develop a citizenry, and we are to develop a sense of hope, awareness, etc. That definition was expanded upon at the 1977 inter-governmental conference on environmental education in Tbilisi. At Tbilisi a set of clarifying goals were proposed. Looking at that set of goals gives us a better sense, maybe even guiding principles, of what environmental education is and what it should be doing.

The first goal was to foster a clear awareness and concern about economic, social, political, and ecological interdependence in urban and rural areas. The second was to provide every person the opportunity to acquire the knowledge, values, attitudes, commitment and skills needed to protect and to improve the environment. The third was to create new patterns of behavior of individuals, groups and society as a whole towards the environment.

It is very important to look at these goals and to look at the definition as providing the context, characteristics, and guiding principles of environmental education. First of all, look at the scope. Within environmental education we are concerned with formal, non formal and informal modes of education. We are looking at a life-long process; it is not just what you do in the third grade, but it continues throughout a person's life-span. Secondly, environmental education is action based. At its heart, environmental education hopes to develop the skills and commitment for action. The focus is on developing citizenship skills. Although we are obviously quite concerned about the global environment, and recognize the interdependence of many different systems, the focus, at least in the United States has typically, and with obvious exceptions, been on local, regional and national issues and actions. The slogan, "think globally, act locally", is appropriate for what we do in environmental education.

Finally, environmental education is characteristically interdisciplinary. Our goal is to infuse environmental education into many different aspects of the curriculum. Environmental education is concerned with economics, culture, social, political as well as psychological realms. We try to promote that infusion in the curriculum through disciplines such as math, science, and art, and through finding connections with educational movements such as whole language. Realistically however, environmental education is found primarily within science, and secondarily within social studies. This contradiction is something we need to think long and hard about. We need to consistently monitor what we are really doing versus what we hope to be doing in terms of the goals and the definition of environmental education.

I would like to finish by saying that my purpose has been to set up a context by which to discuss environmental ethics education, development education, and some of the other very related disciplines, with the goal of finding common ground. Environmental education is strong; it is strong at the local level, at the region level, at state and provincial levels, nationally and internationally. You will see this strength in some of the following panels, especially as we get to some of the international examples. Thank you.

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Tom Keehn

While flying to Montana from the wilds of New York City, across the midwest heartland, I thought of the metaphor of the rivers. This has become a vivid and powerful image for the entire country in recent months. The Missouri river headwaters are not far from Big Sky. After a long journey, the Missouri merges with the Mississippi just above St. Louis. The rest of the story is all too familiar: floods unbelievable and long-lasting; "Color Iowa Blue" was the title of a story in a recent issue of the New York Times Magazine. Nature versus man-made dams and levees has become a hot issue. There's a message here, I believe, for environmentalists and educators, but I won't dwell on that; metaphors are supposed to speak for themselves.

At this symposium we are trying to understand the strands, or the rivers if you will, that are converging either to create an untamed flood or to help build a better world for the next seven generations--as the American Indians have taught us to do when we sit down to think and plan together. It is my hope that at this symposium we have arrived at an auspicious beginning. We have already heard from Bora Simmons about the twenty plus years of environmental education, particularly here in the United States. Parallel to this river have been at least three other educational streams which are related to today's symposium.

Global education has its origin about twenty-five years ago. It brought new global perspectives into education and developed new teaching materials and methods, particularly to secondary schools social studies and higher education. The American Forum for Global Education, which I represent here today, continues to provide national leadership in this field. (Materials are available for distribution.)

Development education began in Europe, Canada, and Australia more than twenty years ago. It has become a significant factor in the U.S. only during the last decade. This strand grew out of the international development movement, specifically the overseas activities of nongovernmental organizations (NGOs) like Oxfam and Save the Children, religious groups, the YWCA and YMCA, and others. Development education is concerned with economic and social justice issues in a global context. It attempted to make connections between program activities abroad and educational efforts in the U.S. linking population, environment, human rights and economic activities combating poverty. Other governmental and multilateral development agencies (the World Bank and A.I.D., for instance) have made important but relatively small contributions to educational programs.

One of the most dramatic examples of development education has resulted from the efforts of 150,000 returned Peace Corps volunteers. This has been an acknowledged focus only in recent years--twenty-five years after the launching of the Peace Corps.

Multicultural education is the newest and potentially the most powerful new movement. It forces education to focus attention on city streets, rural poverty, social disintegration. It is concerned with equity and justice issues in our country and addresses them in a new global context. An excellent symposium on multicultural and justice issues was held at this Big Sky conference and should be studied carefully by all who are concerned about education for global change.

A critical moment which called attention to these new education streams was the Earth Summit held in Rio in June 1992. The official U.N. conference of governments produced Agenda 21, a valuable but limited set of outcomes addressed to governments. Simultaneously in Rio, more than 25,000 NGOs met, more from the South than from the North. Because they were quite frustrated by official Earth Summit agreements, the NGOs produced about 40 "treaties" on a great variety of global issues. These are not legal documents but serve as an educational tool on such issues as sustainable agriculture and over-consumption and life-styles. The NGO treaties talked about the goal of sustainable societies rather than sustainable development used by the U.N. government summit.

Two concluding thoughts seem important to me. First, we need to get our vision straight. We need a clear understanding of the world in which we live and work and learn and that world has changed. It is not the world in which the educational streams we have considered today started a generation ago. The operational word is change. Unless we understand that and clarify our vision accordingly, our educational programs will not deal with global problems and possibilities that confront us.

Second, we need to rethink the language we use. Environmental education or environmental literacy have been the terms most commonly used. Recently I came across a new term proposed by David Orr, an economist who teaches at Oberlin College in Ohio. He suggests we think about ecological literacy--not environmental literacy. This, David Orr says, is a morally and experientially engaged way of knowing, involving a sense of wonder and respect for life, and the realization that all human activities have consequences for the larger ecosystem. He maintains that ecological literacy cannot be achiever by just adding "environmental education" to our compartmentalized curriculum, but entails radical educational as well as economic, political and cultural transformation.

Now that's a big task! Whenever you get into transformation you have a big task on your hands. But this is exactly the challenge we confront as we seek to build new partnerships that will bring educational streams together to achieve justice and peace. We are being defined by the changing realities of our small plant, the earth, our common home for generations to come.

Verne Howe

The concept of ethics in sustainable development is not a new one. The inclusion of ethics as a vital concern to the environmental movement turned up in the *World Conservation Strategy* of the International Union for the Conservation of Nature and Natural Resources (IUNC) in 1980, and again in the report *Our Common Future*, by the World Commission on Environment and Development. That same year at the 12th General Assembly of IUCN, a charter for nature based on the proposition that "all human conduct affecting nature must be guided and judged." Two years later the United Nations General Assembly adopted the World Charter for Nature. Also in 1980, *North-South: A Program for Survival* was published by the Independent Commission on International Development Issues. In 1988, Gro Harlem Brundtland proposed a new holistic ethic in which economic growth and environmental protection would go hand-in-hand around the world.

At the same time that there events were taking place in the United Nations, religious groups were moving in a similar way. As early as 1961, Joseph Sittler, a Lutheran theologian, addressed the New Delhi Assembly of the World Council of Churches by calling for unity among the various churches. This World Council of Churches has initiated many international conferences on the ethics of environment and development. In 1979 at MIT, the topic was *Faith, Science, and the Future*. The themes for the conferences in 1990 and 1991 were *Justice, Peace, and the Integrity of Creation*, and *Come Holy spirit--Renew the Whole Creation*.

Examples of other religious movements and educational projects that have taken place in the recent past are:

- the Buddhist Perception of Nature Project in Thailand
- Seminar "Terra Mater" and Assisi Nature Council in Italy
- Eco-Justice Working Group of the National Council of Churches, USA
- Conferences of Roman Catholic bishops in the Philippines and the Dominican Republic with letters on ethics of environment and development

In 1979, the journal *Environmental Ethics*, was first published; and in 1987 the International Development Ethics Association (IDEA), founded by David Crocker and Mihailo Markovic, held its first conference in Costa Rica.

From the International Conference on Conservation and Development held in Ottawa in 1989 emerged 5 reasons for a new interest in morality and ethics. J. Ronald Engel reported on that conference and in his book, *Ethics of Environment and Development: Global Challenge and International Response*, lists these 5 reasons as well as 5 broad criteria for the emerging paradigm of sustainable development. Ethics are an integral part of these reasons and criteria. The reasons for the emergence of a new interest in morality and ethics, from Engel, are:

- new awareness of the role of values in human activity
- new appreciation of the way in which moral ideals motivate persons to care for the world around them
- role of clarifying the values at stake in policy decisions and giving moral reasons for alternative courses of action
- ethics is helping to resolve some of the outstanding value conflicts that thwart conservation and development projects
- new interest in ethics--helping to define a new social paradigm which will promote sustainable development in each culture and region of the world

The broad criteria for this sustainable development paradigm, according to Engel are listed below with additions:

- integration of conservation and development with the resulting question about human activity which may lead to conflict and the need for conflict resolution
- satisfaction of basic human needs including human health concerns
- achievement of equity and social justice
- provision of social self-determination and cultural diversity
- maintenance of ecological integrity, and
- war and peace issues which include many of the above 5 criteria with ecological, social, health, and community implications

Representatives of the five world religions met in Assisi, Italy in 1986 and shared their beliefs regarding the care of the environment. The representatives joined in an ecumenical worship service in celebration of the "glory of creation". This meeting was a part of the 25th anniversary celebration of the WWF which after the meeting established a permanent program in religion and conservation. The United Nations has also looked into the link between religious ethics and conservation and in 1988 held a global conference for spiritual and parliamentary leaders on *Human Survival*, at Oxford.

The Earth Summit was held in Rio in 1992 and confirmed the importance of ethics. This is reflected in *Agenda 21*. An examination of the ethics of sustainable development leads to an analysis of the component parts--that combine to form sustainable development ethics. Many writers have identified these component parts, some more concisely than others and others with greater detail. However, there is general agreement on the following components:

- Ecological concerns
  Ecology is the study of living organisms and their relations with each other and their physical environment
  Human survival depends upon the success of functioning ecosystems
  Humans equated with other animals not above others
- World religious cultures--ethical concerns--values/attitudes toward the land and living organisms--spirituality combined with war and peace--justice and equity
- Health--According to Engel, Mark Sagoff says that health and environmental protection sometimes come first before economics--that a balance should exist between economic costs and benefits and an ethical assertion of the rights to health protection
- The social values related to health suggest that industry should be considering changes to ensure the future health of the global community
- War and peace
  The ecological, social, and health destruction of war versus peace and development
- Equity and social justice for all people in both developed and undeveloped nations

All 5 concepts are part of sustainable development ethics. Environmental ethics of industrial society help us to establish parameters and promote a commitment to sustainability that may lead to changes in human behavior.

The task of providing sustainable development ethics education remains. There are two general areas for exploration:

- working directly with grass roots organizations
- working in formal education at all levels

Formal education at the college and university level offers an opportunity through environmental studies programs. These programs are dynamic and have been changing over the past twenty years as the understanding of what constitutes environmental studies has changed. Aldo Leopold's Land Ethic appeared in *Sand County Almanac* in 1947. Recognition of the significance of that Land Ethic has encouraged the development of environmental ethics courses as components of environmental studies programs. In addition, environmental studies program developers have been aware of the issue of sustainable development, the reasons for the emergence of the paradigm, and the need for criteria for sustainable development education, and in particular, sustainable development ethics education.

The model that I like presents environmental studies as an example of a truly liberal arts degree program with course work distributed over the three major areas of academic work--the natural sciences, the social sciences, and the humanities. I will not describe a complete curriculum, today, but rather the core courses that in combination provide sustainable development education with a focus on ethics. The courses should be viewed as a continuum with each contributing to the whole. The six courses in this core are described below:

- Ecology, simply defined as the study of living organisms and their relations to one another and to the physical world that supports them, is the basic natural science. An understanding of the relationship of humans to natural systems is essential
- The role of humans in the global ecosystem is the second area of study that we label environmental history. Environmental history courses appeared in the 1970s. They provide an understanding of the ways in which the values of, attitudes toward, and the behavior in the natural world have not only changed the perception of the natural world, but also, have led to policy changes that have had an impact world wide, and the promulgation of environmental laws
- The need for students to understand the reasons for and development of these laws, as well as the content of these laws themselves, is the third area of study, environmental law
- Along with the laws, the costs and benefits of development actions and results of the passage of new environmental legislation indicate the need for a course in environmental economics. The understanding of economic principles and natural resources economics is important to an understanding of sustainable development
- In the course work involved with these last four courses, ethical considerations arise and need resolution. At the same time, concern for all life on the planet and the need to understand values related to non-human species and their relationship to humans develop as well as answers to questions of equity and social justice. Such a course, environmental ethics, may be used as a vehicle to bring about understanding of the ethics of sustainable development
- Finally, the inclusion of a course in environmental policy and politics explores the reality of the political process.

This curriculum model has been and is being used to provide sustainable development and sustainable development ethics education at the college and university level. Such a blend of educational concepts needs to be translated into education programs for grades K through 12. The needs of adult learners for similar educational opportunities should be met as well. Studies at the grass roots level should be as diverse as the formal studies so that sustainable development ethics education reflects the meshing of all areas of study that can lead toward citizen and/or community development of value systems that can help to bring about change in perceptions of the world and so to changes in behavior, the objective of sustainable development ethics education.

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Liam Downey

Over the last few decades Environmental Education (EE) has generated enthusiasm and interest in environmental issues throughout much of the U.S. Nevertheless, EE practitioners acknowledge they have been less successful in poor and people of color inner-city communities (these communities will be referred to as inner-city communities throughout the paper. EE in these communities will be called Urban EE). The Environmental Education in Minority and Multiethnic Communities Work Group concluded that "despite the environmental risks that minority and multiethnic communities have incurred...few programs in Environmental Education are directed toward of involve these communities. [Moreover], traditional approaches to Environmental Education have not worked well in these communities in the past (EPA, 1992: 167)." Cooper and Smith (1989: 76) state that "although some excellent [EE] programs, geared for minority and urban youth, have surfaced, such programs have been the exception rather than the rule." They cite limited community support and "the design and approach of most...EE programs" as important factors impeding EE's efforts in inner-cities.

If EE has not worked well in inner-city communities, what might make it more applicable in the future? This paper argues that the Environmental Justice Movement, which has been successful in these communities, can offer insights into environmental issues that matter to inner-city audiences and organizational approaches that have been successful in these areas.

The Environmental Justice Movement

The Environmental Justice Movement (EJM) has effectively brought to the forefront environmental issues of concern to poor, working class and people of color communities. It has filled "the void in research focused on environmental problems confronting racial minority communities...(Lee, 1992: 13)," and organized thousands of communities to fight to eliminate environmental hazards facing them. EJM has shown that although poor communities experience greater environmental risks than wealthier ones, when both race and socio-economic status are taken into account, people of color bear the impact of environmental hazards most heavily (Mohai and Bryant, 1992); (Gelobter, 1992; UCC, 1987).

This inequitable distribution has devastating consequences for many communities. For instance, Tucsonians for a Clean Environment link well-water contamination from Hughes Missile Base and City Airport to a high incidence of illness and death from cancer and lupus, and to babies born with heart defects in their community. In these predominantly Hispanic and poor communities illness and death have broken families, made it difficult for families to make ends meet, and left psychological scars.

How EJM differs from the traditional environmental movement

Both EJM's agenda and approach set it apart from the traditional environmental movement. According to Taylor (unpublished), EJM has allowed community groups to define, prioritize, and work to solve environmental problems which they deem important and relevant to their lives. The resulting expanded definition of environment links social and ecological issues. EJM considers homelessness, drugs, violence, litter, and the racial and economic biases that drive the citing of hazardous waste facilities to be environmental problems. Not only do they represent aspects of degraded human environments, they also results from an inequitable distribution of natural resources which has led to an inequitable distribution of environmental benefits and hazards.

'EJM argues that environmental hazards such as lead poisoning, industrial pollution, and hazardous waste impact people of color, working class, and poor communities to a greater degree than white and wealthier communities. Since health problems arising from these hazards prevent many individuals from developing to their fullest potential, EJM sees environmental problems as a matter of civil rights and workers rights (Mann, 1991; Taylor, unpublished: 8).

Environmental Education and its goals

Such a perspective is often missing in EE. Most EE programs and curricula deal with ecosystem issues and ecological communities, and often present them from the perspective of wildlife. Urban EE efforts, for the most part, have presented the same issues by removing inner-city residents from the inner-city environment or using natural systems in inner-cities as instructive examples of ecological principles. In fact, EE has been criticized for reinforcing students' negative feeling toward inner-city environments by focusing positive attention only on the natural in these areas. The Environmental Justice perspective argues that rather than relying primarily on environmental science and ecosystem education, Urban EE should include the study of the built environment and social, political, and economic relationships.

Since EE's strength is its innovative approaches to teaching ecosystem and environmental science, why should EE take on new content areas? Interestingly, EE has committed itself to doing just that. Articulated in EE's goals and visions is a commitment to create an environmentally literate, competent and aware citizenry involved in decisions that impact their communities. EE works both to teach about and preserve a healthy environment and strive for and ensure democracy. The Tbilisi Declaration states the core tenets of EE which reflect many EJM concerns:

- A basic aim of [EE] is to succeed in making individuals and communities understand the complex nature of the natural and the *built environments* resulting from the interaction of their *biological, physical, social, economic and cultural aspects*, and acquire the knowledge, values, attitudes and practical skills to participate in a responsible and effective way in anticipating and solving environmental problems...
- [To] *enable learners to have a role in planning their learning* experiences and provide an opportunity for making decisions and accepting their consequences.
- To carry out these tasks, environmental education should bring about a closer link between educational processes and real life, *building its activities around...environmental problems...faced by particular communities...*(emphases ours).

If EE is to take these goals seriously it must work with individuals, organizations, and communities with different viewpoints and emphases. EE needs to adapt to local conditions and introduce itself to others by asking, what problems affect your community most, and what issues interest people in your neighborhood? Rather than making people interested in EE, EE should make itself interesting to people in various situations with varying backgrounds.

Practical Implications for EE

One might conclude from the foregoing discussion that this paper is arguing for EE to discontinue ecosystems and environmental science studies in inner-cities. This is not the case. First, many within EJM have highlighted the pressing need for more people of color and women trained in the environmental sciences. Second, these communities have positive heritages that reflect strong positive bonds with the natural world that offer insights new to EE. Third, EJM's critique suggests that EE would be more effective in inner-city communities if its initial emphasis was upon environmental problems of concern to local audiences. EE can explore with students the interconnected web of dynamic historical, social, and cultural relations which have resulted in the modern, built environment and the myriad of environmental problems which threaten specific communities. While an emphasis upon social issues must be sustained, EE can use students' developing understandings of the urban, built environment as a foundation from which to establish connections between human and natural communities.

Conclusion

While the Environmental Justice critique is quite different from that put forward by EE, the Two movements share many similar goals and approaches. Both believe that in order to raise environmental awareness and move people from awareness to action, environmental issues must be relevant to them. They both realize the importance of allowing citizens and local citizens groups to choose those environmental issues about which they are most interested and concerned, and stress the need for citizens to learn decision making skills, understand social and ecological processes, and take leadership roles in solving environmental problems. Both believe that citizens, as individuals and communities, can be active in the decision making processes that shape their lives.

A critical issue, then, is the development of a dialogue between EJM and EE that can serve as a foundation for collaboration between individuals and organizations within the two movements. What collaborative efforts will look like and the potential of collaboration to strengthen organizations in EE, EJM and the environmental movement as a whole are questions demanding serious thought and creative answers.

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Marshall Case

If I look at environmental trends and the large conservation organizations, I see *A Call to Political Action*.

First, let's look at the National Audubon Society and the early days of the conservation movement. Actually, the Audubon movement began in the late 1800s to protect birds, and involved militant people who worked as political activists. In fact, the chargg was led by *Urban Women*! Feathers of wading birds, in particular, were being taken for hat fashions and entire bird colonies were being destroyed. The bird image stuck over the years.

Today, Audubon's political action involves many areas-beginning with the Alaska Coalition years, Audubon has tackled many tough issues by developing programs and campaigns with:

ENERGY-an actual Audubon Energy Plan
SOLID WASTE-partnerships with municipalities and local Audubon chapters
POPULATION-wildlife and wildlife habitat are in direct relationship to human population

Media projects have developed in parallel with the buildup of political action. Television has been the biggest single investment. Many television productions reach tens of millions of viewers each year and Audubon's TV series moved quickly from wildlife and wildlife habitat focus to address key issue areas and a call to the public to act. The best example is probably the film-"Rage Over Trees". Special interest groups moved quickly to keep this film off the air. Even thought he result was a major loss of financial sponsorship for the film series, Ted Turner of TBS decided to air the films and absorb the costs of normal commercial paid time. Several other films have since produced the same reaction from other special interest groups.

Audubon's traditional ecology workshops and camps now include activist components. These workshops still include large numbers of teachers but have added an increasing number of professional people looking for a vacation/learning experience. They are motivated and the political activist component of the experience has resulted in the addition of a number of them to the "active" roster of Audubon.

The Washington, D.C. office has expanded from a few to over thirty staff within the past dozen years. They conduct "boot" camps to educate local Audubon leaders from around the country. These folks go back home prepared to fight and win issues, concerning the rights of wildlife and people.

The AUDUBON magazine has also made a major shift to include education on political issues with many articles directed to action as connected to wildlife and wildlife habitat.

What about the Education Division of Audubon and its role in current times? This has been a struggle to justify the existence of traditional programs and facilities while dealing with major fund-raising goals and attempting to include politics, where possible (without making trade-offs with program integrity). The ecology camps and centers have already been addressed here.

The nature centers have been regionalized to expand their influence beyond the local communities where staff are located. A major role now includes working with state and regional conservation groups and with the professional environmental organizations in multi-states served by each center. Service to the extensive Audubon local chapter network is also a high priority, including networking with other divisions and departments of Audubon to help promote political action through workshops at the various facilities. And, of course, the major role is to serve as a model environmental education center within the region. Aullwood Audubon Center and Schlitz Audubon Center are the best examples of these leadership positions, one in Dayton, Ohio and the other in the greater Milwaukee area.

Additional international ecology workshops have also been added to form partnerships and train international educators/biologists to take the lead in their own countries.

Urban teachers now participate in the Audubon Science Institute where they learn computer skills connected to programs about the environment, reaching a new audience.

Audubon's Expedition Institute College, using buses and the outdoors as the learning environment (and classroom), now has an expanded master's degree program. These students face the problems with the environment while in the field and have a good grasp of what needs to be protected by the time they graduate.

The most exciting program in recent years has been the development and growth of the national youth conservation club school classroom program-Audubon Adventures. Over 400 chapters participate in the community/school/chapter/national partnership. The environmental study curriculum, based on natural history topics, has reached 2 million children in the first nine years of the program. Hundreds of thousands of urban minority children have been involved in these classroom clubs with city partnerships developed in Houston, Los Angeles, Cleveland, Atlanta, New York City, and other cities.

Audubon Month has been developed to focus students on a topic of concern and give them the visual tools, through multi-colored posters and accompanying leaders guide, to be aware and hopefully moved to action to help save a rain forest, protect a wetland, etc.

I should mention that the buildup of action type material was very slow to make certain that it didn't extend beyond the school administration comfort zone.

Two international education projects have been built up over the past three years. Working with rain forest alliance professionals in Costa Rica and local members of a new Audubon chapter there, youth education materials were reformatted, including regionally appropriate art, and translated into Spanish. The layout was produced in the United States but the materials were printed in Costa Rica by the largest newspaper and folded into their regular edition, reaching 100,000 households. It was so popular that additional issues have been produced and up to three per year may reach this new audience. Other countries in Central America have now expressed an interest in doing the same thing. Topics have included migratory birds, sea turtles, sea mammals and other subjects common to the Americas.

Russia has been the other international partner and a number of cooperative projects have included translation of curriculum materials for use in classroom and teacher training, joint run international ornithological camps, exchange of educators, and producing children's television segments with Russian State Television for their widely watched "TAM TAM" News show. Some of these topics have focused on what children do to clean up and protect their environment, in the United States and Russia.

We've worked since the early '60s to build awareness, information and participation. Recently, there has been a push by some large organizations to shift even more financial and people resources into political action.

Many big businesses now concentrate on marketing nature products to gain the attention of children and support for their products. Notice that urban areas will have less than the suburbs from these efforts.

Who will provide the environmental trends for the next few years and beyond? Will it be profit making businesses, schools, churches, organizations like NAAEE, or perhaps partnerships. Will we look beyond our borders to developing countries?

I'm impressed with Russia and the Commonwealth-crossing 11 time zones and making up one-sixth of the land mass of the globe. The natural resource base is immense and the potential for destruction is overwhelming. Environmental education could play a key role in this vast and most interesting land with millions of eager students and teachers.

As we look to the future, we need to incorporate these new challenges into our thinking, planning, and action if we are to be true stewards of our global community.

PANEL II

Michele Perrault

Our first speaker on this panel will be Tom Hudspeth. He is a teacher in the Environmental Studies Program at the University of Vermont. The second speaker will be Gary Enns from Manitoba, who began his career as an educator in the humanities, and since then his work has included action research, program planing, management and development, and in particular work in Canada and sustainable development education in the Manitoba school system, grades K-12.

Following Gary will be Isabel Castillo, who has worked for 15 years in education in Mexico, founded two schools, developed curriculum and training workshops, and for the last three years has been working with the World Wildlife Fund in Mexico. Natalya Tarasova is an Associate Professor with the Department of Industrial Ecology at the Mendeleev Institute of Chemical Technology, Governing Board of the Mendeleev University of Industrial Technology, Member of the Council of Environment Education, is part of the Ministry on Environment and Rational Use of Natural Resources in Russia, and a member of the European Group on Environmental Education. Aleksandr Khachaturov is the President and Founder of the Moscow International School of Business and Science.

Tom Hudspeth

I should point out from the very beginning that I am an American, so I am speaking about the United Kingdom only because I lived there this past year while I was on sabbatical. Putting it in context just briefly before I talk about some of the efforts that have been made in the United Kingdom linking environment and development education and even coining the term education for sustainability, I would like to point out that they do have a National Plan in the United Kingdom, and they have had it for several years. There are nine mandatory subjects, environment is not one of those, science is one. There are five cross-cutting themes, including environment studies, that is what they call it, and citizenship studies, which are not mandatory. My sense, acquired from attending many conferences and seminars such as this, is that because they are not mandatory, they are not dealt with by many teachers. There are well developed standards in each of the nine mandatory subjects. Geography is one of the mandatory subjects and development studies issues and global studies issues are integrated into geography to a fair degree. Environmental education types of issues are integrated into science courses, where they are dealt with at all, and in some cases integrated into languages courses, primarily English. To make a generalized statement, the British are far ahead of the United States in terms of environmental education because they have been much more pro-active.

For the United Nations Conference on Environment and Development, a group of NGOs got together and formed the EDET Team, which is the Environment and Development Education and Training team under the auspices of the United Nations Environment Programme's United Kingdom Branch, with the primary guidance of IIED, the International Institute of Environment and Development, which is much like the World Resources Institute, WorldWatch and other international think-tank type groups, based in London. Many NGOs formed that EDET Team. Post-UNCED, EDET changed its name to Education for Sustainability Forum. This really is a coalition of environmental education groups such as the National Association for Environmental Education, the Council for Environmental Education, English Nature, and many of those together with some that you normally think of as development education groups, such as the Catholic Fund for Overseas Development, NADEC, which is an umbrella group for development called the National Association for Development Education Centers, which has over fifty development centers around the UK, Oxfam, Save the Children, The British Council, and many others who are more involved with development types of issues, such as World Awareness.

This EDET group had over 1,000 consultations, so they really did their homework. The consultations could be individual, with the government officials at all levels of government, meetings with other NGOs, and they took place over a two-year period in preparation for the UNCED. They put together a publication called "Good Earth Keeping: Education, Training and Awareness for a Sustainable Future." Since UNCED, they have been pro-active, and quickly meet with their UN officials to state their desire to work with members of the UN Commission on Sustainable Development, and they have been major players. By the way, their Commission was started immediately after UNCED, so it is much more up and running.

One additional comment to the term sustainable development. I think that the term is much more in people's minds in England and in Europe in general than globally recognized. When the delegates from the Brundtland Commission returned to their homes, I think that Maurice Strong made a fine effort to travel around Canada and talk up sustainable development. Many of the other European delegates did as well. When Bill Rauckelshaus came to the United States, very few people outside of Washington, DC knew much about it outside of academic fields, and some NGOs when Our Common Future was then published. I think that the term sustainable development has been much more out in the public eye and vocabulary in Europe than it has been in the United States.

Just to briefly touch on what is covered in this report, they defined and coined this term "Education for Sustainability," which was a blending of many of the concerns of environment and development education, and their use of the term development education encompasses some of the things that Tom talked about, what they think of as global issues, development issues and particularly the advocacy thrust, sharing similarities with the environmental justice movement that Liam discussed in the first panel such as empowering oppressed people, those who are suffering some of the poverty and oppression, and empowering them to do something about it. Therefore they are linking poverty and environmental degradation and showing the impacts on humans.

The first part discussed what education for sustainability is and how it builds upon environment and development principles, and laying out those principles. They emphasized the role of NGOs, partly because EDET's Team was comprised of NGOs themselves, and they believe that NGOs can play a powerful role in sustainable education, and therefore, they emphasized that. The report delved into some more specifics in later chapters in terms of instruments and tools that can be used for education for sustainability efforts, specific directions and actions for change where they laid out a framework where you can pull together the efforts of government, NGOs and individuals from both the environment and development communities, and finally a summary message for action and where to go from there. Also included in "Good Earth Keeping" were some 35 case studies of what they considered to be successful beginnings of links to environment and development, which they have in highlighted boxes some of the things that groups and individuals were doing. An example here is called "The Valuable Focus," which features a few of NADEC's centers.

In closing, I would like to reiterate my opinion that within the United Nations they have been much more pro-active in terms of talking about and thinking about sustainable education and the linking of traditional environmental education and NGOs to development education and NGOs. The government has played a relatively background role. The government did pay for the publication and dissemination of the Environment and Development Education and Training Team Report, but only after the NGOs had taken the initiative and done the work behind it.

Gary Enns

Educators are beginning to recognize the importance of sustainable development as a decision-making tool which lets us consider the economy, the environment, and the health and well-being of society as essential elements of an integrated whole. Sustainable development also calls on us to think globally and act locally, resulting in a degree of re-thinking of the meaning of "development education."

Each province in Canada has adopted principles for a sustainable society. These principles vary and the language may differ, but the essence is the same across the country. The objectives for sustainable development, as defined by the National Roundtable on the Environment and the Economy (NRTEE) state: "The natural world and its component life forms, and the ability of that world to regenerate itself, through its own evolution, have basic value. Within and among human societies, fairness, equality, and diversity and self-reliance are pervasive characteristics of development that is sustainable."

The NRTEE Principles of sustainable development are listed under the following headings:

1. Stewardship
2. Shared responsibility
3. Prevention and resilience
4. Conservation
5. Energy and resource management (footnote: This point is contentious. Industry and government interpretations often differ from those educators, environmentalists, consumers, etc.)
6. Waste management
7. Rehabilitation and reclamation
8. Scientific and Technological innovation
9. International responsibility
10. Global development

Variations on these principles are in place in all provincial and territorial jurisdictions in Canada. In Manitoba, the Premier chairs the Manitoba RoundTable on the Environment (MRTEE), giving sustainable development high visibility. The province also has assisted communities and regions to set up RoundTables on a voluntary basis. These are at different stages of development, and have yet to impact on local educational initiatives.

Manitoba has established a very specific linkage between the education system and the Manitoba Sustainable Development Coordinating Unit. The Manitoba Education department's sustainable development curriculum consultant is a member of the MRTEE Education Committee and works to integrate RoundTable recommendations into departmental programs. The MRTEE Education Committee recommended Manitoba Education and Training assemble sets of Introductory sustainable development curriculum resource packages for use by teachers in K to 12 classrooms.

A survey of Manitoba educators and administrators was conducted before research, development, and production of the Sustainable Development from educational institutions and organizations at the provincial level. This is not because educators are in disagreement. It is more an issue of available resources and how they can be best allocated.

Those of you, who are from Canada, know we are in the middle of a federal election. Whether a change in government will result in a change in federal sustainable development and environmental educational programs is anybody's guess. Whatever the outcome of the Canadian election, I am sure we will see some changes in our environmental and our sustainable development programs.

To date, the Conservative government has built on the recommendations of the Brundtland Commission. Soon after the WCED Report was brought down in 1987, the Canadian government announced a number of initiatives to introduce and implement sustainable development thinking into decision-making processes in Canada.

The Roundtable concept was adopted at the national level when the National Roundtable on the Environment and the Economy (NRTEE) was established by the Prime Minister of Canada in 1989. From that particular organization and structure, which included stakeholders from all sectors and regions of the country flowed an approach to sustainable development thinking and actions which was received with mixed reviews. As a result of the federal initiative, every province and territory in Canada has similar Round Tables on the Environment and the Economy.

Each provincial and federal Roundtable has in its mandate a specific objective to introduce sustainable development educational programming as part of formal, non-formal, and informal educational initiatives throughout the country. Because provincial educational jurisdictions are jealously guarded in Canada, any attempts on the part of the federal government to set the educational agenda meets with resistance by provincial educators and governments.

The process in Canada lacks uniformity. However, there is a great deal happening to introduce sustainable development into Canada's diverse and varied educational programs. Two provincial departments of education, at this point, are actively working to introduce sustainable development education into their school systems. All provinces are exploring ways in which to incorporate the concept of sustainable development into school curriculum.

Every provincial department of education employs curriculum consultants who are looking at ways in which to incorporate the sustainable development concept into curriculum. Provincial Roundtables on the Environment and the Economy are pushing the educational agenda forward through the creation of education sub-committees mandated to identify the role of the RoundTables in sustainable development education for all Canadians. Formal education invariably is part of the discussion.

Curriculum Resource Packages went forward. Environmental educators were surveyed unanimously stated they were ready to move beyond the outdoor education recycling, tree-planting, and environmental education as exclusive to science.

Consequently, the resource packages were designed and developed for both social studies and science teachers. They explore ways in which economic, social, and environmental factors can be integrated into a sustainable decision making process which will ensure the sustainability of all three. The resource packages are being piloted this school year throughout Manitoba.

It is important to keep in mind that "development" is a qualitative term and not a quantitative synonym for "growth". In other words, sustainable development is not sustained economic growth as we have come to think of it, but economic activity which produces a qualitative development, an improvement, which does not equate better with bigger.

In British Columbia the term" development" has been completely separated from the development of initiatives of "Sustainability". The B.C. RoundTable has prepared a document which recommends actions which can lead to a "learning for change." The B.C. Ministry of Education is in the midst of a major re-working of their curriculum and will be incorporating the Round Table concepts and recommendations into all strands of a cross-curricular program of studies from Kindergarten through Grade 12.

Other provinces are also starting to integrate starting to integrate sustainable development into their curriculum initiatives. New Brunswick and Ontario have developed specific resources which are waiting to be introduced. Alberta has developed a very active environmental education program, and anticipates building on its successes to introduce sustainable development to Alberta schools.

A number of Non-Governmental Organizations, such as the Pembina Institute and the SEEDS Foundation out of Alberta have played a key leadership role in keeping the environmental education agenda front and centre in discussions of sustainable development education in Western Canada. The Harmony Foundation has provided similar leadership in Ontario. There are many other organizations throughout Canada which assist environmental educators, facilitate and coordinate services and promote the environmental agenda.

The environmental educators surveyed in Manitoba were pleased to hear that sustainable development education would get environmental issues, information, and concerns beyond the doors of the science classroom and laboratories. They were pleased to hear that global issues would be incorporated into discussions of sustainability. They are testing the concept in Manitoba classrooms this year, using resource packages prepared by Manitoba Education and Training.

Learning for a Sustainable Future is a non-governmental organization based in Ottawa. Previously part of the Conference Board of Canada, it has been working to coordinate sustainable development educational efforts and activities of provincial initiatives. Its staff have participated in workshops and planning sessions in many of Canadian provinces. They recently became an independent non-profit agency, and are seeking ways to link global and local sustainable development educational initiatives.

The government of Canada has not limited its role to the National Round Table and has produced an extensive "report card" on the Canadian State of the Environment. This Environmental Report is used as a text in a number of university environmental science courses. Canada's "Green Plan" has played a leadership role in moving the environmental discussion to the Canadian public. The federal Department of the Environment has introduced an "Environmental Citizenship Program" within the framework of this Green Plan. Although it is not linked to any specific educational programming, the Environmental Citizenship Program is designed to introduce the principles of sustainable development to Canadians.

This department produces excellent materials on environmental issues which are suited to sustainable development discussions in formal, non-formal, and informal education. Other federal departments also provide information which has value within existing environmental education programs. Sustainable development education can build on these resources in its consideration of economic, environmental, and societal issues within decision-making models.

Canadian educators are aware of the significance of "learning for sustainability". In a joint declaration entitled "Education to Promote Environmental Citizenship" these leaders called on all educators to nurture environmental values and attitudes in all their students to ensure the earth's resources can be sustained for future generations.

The Joint Declaration lists more than a dozen signatories including: The Canadian Community Colleges Association, Canadian Association for Adult Education, Canadian Association of Principals, Canadian Association of School Administrators, University Continuing Education Association, Canadian Association of Business Professionals, Home and School and School Boards Association, the Canadian Teachers Federation and the Royal Society of Canada.

The Royal Society of Canada has launched a Global Change Program which has produced educational resources designed to assist educators in the introduction of sustainable development to senior years students. The NRTEE has produced a Youth Kit aimed at helping young people set up their own community Round Tables.

I have just scratched the surface of this short presentation here today. For example, I have not touched on the number of Sustainable Development Summer institutes offered at Canada's universities and community colleges. I have not mentioned the research and resource development provided by the international institute of Sustainable Development based in Winnipeg, Manitoba. I have not highlighted the industry and corporate initiatives which provide resources to Canadian educators in exploring sustainable development themes.

The British Columbia Round Table education report is titled "Towards Sustainability: Learning for Change." Sustainable development education offers a model which makes it possible for us to learn to be a positive part of this change. Sustainable development demands profound change in our way of thinking, in our approach to decision-making, in our values and ethics.

Our whole society must learn to think and act in new ways. For environmental educators this change has already started. Sustainable development education, regardless of how it is defined, offers our generation and future generations a model of decision-making which recognizes that the health and well being of our society and of our economy is dependent on the health and well being of our environment. It offers us the hope that our planet, even though we have badly used it, will be able to meet the needs of future generations.

Isabel Castillo

First I would like to introduce you to my country, Mexico, then I will describe briefly our education system compared with your American one and finally I will give you a perspective on environmental education activities.

Mexico by size is the fifth largest country on the continent and the thirteenth in the world (1,953,128 square km of continental territory and 5,073 square km of island territory). We have nearly 81 million people and about 40% of them live in four federal entities: The State of Mexico (9.8 million); the Federal District (8.2 million); Veracruz (6.2 million) and Jalisco (5.3 million).

Mexico is placed among the 10 countries with the most biological biodiversity in the world, a privileged geographical position-between two biogeographical zones contributes to this fact. Mexico is an important hibernation area for migrant bird species from the northern part of the continent, it hosts about 51% of the bird species of North America. Among tropical countries we are first in number of mammal species and third in number of plant species and combined with Brazil hosts about 60 or 70% of the world's biological diversity.

Politically Mexico has always been a leader among the Latin American countries and now if NAFTA passes it will have a greater impact in the world's political and economical arena.

Now, regarding education; the basic education system is centralized. The federal government dictates policies and curriculum up to grade eight, textbooks are produced by the federal education ministry and are mandated in all schools, including the private ones. This year the Federal Ministry of Education delegated some education activities to the state level and it seems that in the near future the entire basic education system may be decentralized.

The education system from grade nine up to the university level is decentralized. The high school curriculum is defined by the local university. Universities develop their own curriculums.

I hope that the information I just gave you can serve as a framework for the environmental education activities I will be describing.

In the United States and most developed countries, the environmental education "movement" was initiated in the 70s when the Stockholm, Belgrade, Tbilisi meetings on environmental education prompted many countries to incorporate environmental education into their education system. Soon after these meetings, courses and graduate studies were offered in several universities. I think that we could say that the environmental education movement was "born at the university level" giving it a strong academic direction.

In Mexico however, prior to the 1970s we could find isolated and short term environmental education initiatives since the early sixties, the first strong impulse to environmental education was given by two key facts, one was the establishment of an Environmental Education Department within the government environmental ministry in 1983 and the other was the establishment of a national coalition of non-government organizations (NGOs). Research shows that before these two factors there had been no more than ten EE activities (seminars, workshops, projects, etc.) per year and after they went up to '90. I think we could say that the environmental education movement in Mexico was "born at the government/non-government organization level" giving it a strong social rather than academic direction. I think we could include in this statement all Latin American countries.

A survey carried out in 1991 shows that there are at least 650 professionals from different social and scientific backgrounds working on environmental education related activities, some with programs that are more than ten years old. Many of these professionals are now within the government and many others are implementing post graduate studies at different universities, for example, an environmental education master's degree was opened at the Pedagogical University last year.

Universities and government education systems are incorporating environmental education in their curricula in response to pressure coming mainly from the non-government sector. At the basic level education in Mexico is suffering from political turmoil. Curriculum guidelines have been modified three times during this presidential period. At this moment environmental education is not part of the current curriculum guidelines. However, the NGO community is very active developing environmental education training programs for teachers.

The Earth Summit produced a strong impact among the NGO community, the universities and the government. Sustainability has started to play a more relevant role and this is being reflected in the programs and projects on environmental education. The environmental education movement has now been molded by the community's social and environmental needs. My feeling is that the countries commitment after the Earth Summit and the constant and increasing pressure of the NGO's community is going to influence the direction of environmental education activities towards sustainable development.

Changing current patterns of economic development will lead to sustainable development. Environmental educators, not only in Mexico but all over the world, play an important role in this change by applying processes that will empower people to find their own solutions.

Natalya P. Tarasova

If we are talking about political dynamics, let me say, I come from Russia, and in my country everything happens everyday. And when I was listening to Dora's presentation, another idea leapt into my mind. The first conference on EE under the UNESCO sponsorship was in Belgrade. The second was in Tbilisi and the third was in Moscow. So, I do not advice you to invite UNESCO to the United States: they will crush your country!

To begin, I would like to give maybe two ideas about the mysterious Russian character. Without this, you will not be able to understand the situation with environmental education in my country. First, my civilization is very old. We have thousands of years behind us. Barbars came, Tartars came, Polaks came, French came. We still exist. But we have a capability to absorb the knowledge that comes from other worlds. We know how to do this and how to implement this knowledge to our own profit.

Second, in my country, environmental education, in the western understanding of this word, does not exist. In my country, environmental education always went through the science education. And so scientists were aware of what was happening in the world. Going back to the twenties, the early twenties, we had a philosopher, physicist and geologist, Vernadsky--maybe you've heard of his works?--who wrote about the noosphere. It was fifty years ago. Noosphere: this is the state of humanity which that will follow the biosphere of our time. This is the sphere of knowledge. And this is the result of technical development. So these ideas were published in Russia about fifty years ago. But they were all closed in scientific circles, because the Academy of Sciences, the scientific community, they were much freer in expressing their views than the normal population.

For the rest of the population, we didn't have environmental problems. Because (maybe you will be surprised) even data on the quality of the environment were considered to be secret, so you could not get samples. Even four years ago we had problems with my students gathering samples of air in Moscow. Why so? Because the socialist system officially was treated as the best system in the world. If you have the best systems you shouldn't have problems. If you have environmental problems, they all come from abroad. This is the consequence of capitalist development. No problems, no ministry. No ministry, no official policy. But still we had normal people, honest people, who took care about the environment.

And that's why the first report for the Club of Rome--you remember the Limits to Growth in 1972?--was also submitted to the Russian Academy of Sciences. There were three countries touched by this report: the United States--it's Boston, MIT, because the chief came from MIT. It was led by Dennis Meadows. And I am proud to say that he is an honorable Doctor of my own university. We honored him before the United States did it. Second report was made in Brazil, because the ideas of dynamic equilibrium, touched mainly the developing world. You know this theory so I will not tell you. And the third report was done in Moscow. I believe that none of you in this room know this. So Dennis spoke about the results of this global focus, about the catastrophe, about the need to sustain the earth, to help the earth to survive. Our scientists listened to what he had to say. We also had institutions which worked on global-focusing projects, because we were a superpower, with an interest in understanding our country's future.

Our scientists told Dennis, "Well, it's good for the rest of the world. We are socialist creatures and not biocybernetic creatures. So it is not valid for Russia." For the first time, this report was translated into Russian only two years ago and became accessible for the population. So you see, such contradictions: on one side the scientific community, and on the other side the command economy, and a communist party that governs the whole country. We didn't have NGOs in your sense. They all were ruled by the communist party--to a greater or lesser extent.

When Gorbachev came to power, the first step he took was to appoint a new minister for education. This man was a strong environmentalist who came from the sciences; he worked for nuclear projects. He was very well educated. And the second step Gorbachev took was to create the Ministry for the Environment. So by 1989, we had an official curriculum, both for secondary schools and for universities and we had at least a state policy to make the right to know open to everybody. So NGOs began their work. Independent began their work. But these green ideas were used by politicians, to be elected to the new Supreme Soviet, and after the elections were over, they all forgot about these ideas and so they compromised these ideas. Do you understand? They compromised these ideas that environment and NGOs can be independent. And this is what we have now. (This is my personal opinion).

By that time, we began many programs with the United States. I am glad to greet here Tony Cortese--from Tufts University, he used to work there--whom I met in space! You see, we had eight space bridges with Tufts University, and with other universities here on environmental issues. Can you imagine how much it cost? Eight spaces bridges on global warming, on air quality problems, clean water problems, etc.

We started programs with the Netherlands and with the United States, but this is in science education. This book is an example of our production. This book deals with sustainable development. There are chapters on energy conservation, on life cycles of plants. (It's very important--because we developed technical approach to this problem.) There are also chapters on food production and population growth and it is done by a team from the Netherlands, Russia and United States. And more than 1,000 teachers in my country use this book. Now it is an everyday activity.

The third example: we worked with Great Britain. Maybe I am not very modest but we implemented our technical approach to their environmental education. Because if you speak of the sustainable development, you should take all the technical systems, all the plants, all industries into consideration. And it is not traditional for those who take care of grass, trees, birds etc. So we brought a group of British people from Hartfordshire University--after that they became a university; they used to be a Polytechnical School--to one of our wetlands in the Shora Region. And I saw a professor, an old man, who was crying. What he had found was a species of a grass that had not existed in Great Britain since their industrial revolution.

So, we had a very good project. This is a report on the project. And it helped us to invite Margaret Thatcher to become our honorable Doctor. And this July she became an honorable Doctor of my university. She will give us funds to support work on environmental problems. Well, first of all she is a charming woman. And second, we are moving toward a capitalist market society, so we have to do it!

In my country, 95% of secondary school teachers (and universities traditionally work with secondary schools) are women. And they have souls that are always open to human issues. It is easy to work with women if you speak of nature, but it is harder when you speak about technical recycling etc. (But we will overcome this.) And this book is an example of what a Russian woman can do in Africa. One teacher was sent to Africa, to Nigeria to help her husband, to stay with her husband. He is an engineer in a metallurgical plant. And they had French people, German people, and of course, Native people in this area. And this is what she did in two months. This is a volume of children's questions and answers about the earth. "What is clean water? What is sustainability? (They use this term here.) What should we do?" You see, we have 95% of such women, so I am optimistic for my country!

And the last suggestion, maybe. Recently we issued this volume. Nothing special: the word "peace" in 100 languages, that's all. You'll find peace in all these languages. I suggest we do the same thing about the environment. So our children could understand us and themselves better.

Aleksandr Khachaturov

The training of specialists in the field of environmental management is based on the idea of the necessary balance between economical and ecological aspects of the profitability of natural resources management. Some experiences in organizing environmental management courses for leaders of industries and enterprises are presented.

The Moscow International School of Business for industry and Science (MISBIS) was founded with the financial support of a Russian privately owned company, MOCT, in February, 1992. MISBIS is a private school with priority orientation providing additional training for graduates of technical and science colleges in order to enable them to work under conditions of a market economy.

Today, as a result of conversion, population migration, privatization, decline in production, and bankruptcy of some factories, there is an increase in manpower supply. Many specialists can find employment only after professional retraining. Retraining is especially important for those who have decided to start their own businesses or work at a privatized enterprise.

We think that adaptation for the new economic conditions is most acute for 'white collar workers'. A paradoxical situation has been created as, on the one hand, people with higher education can't find applications for their skills, and, on the other hand, Russian industry and science badly need capable managers who know market economy laws.

We have elaborated on and already implemented such teaching programs as 'Enterprise in the Market Economy', 'Commercial Bank Operations', 'Bookkeeping and Accounting' and 'Environmental Management.' The 'Environmental Management' course appeared among our programs not by chance but because our School was founded in the Chemical Technology University. Working on the program, we remembered that obligatory environmental education on all levels was introduced in a law on 'Environmental Protection' recently passed by the Russian Federation.

The international concept of stable development, meaning the organization of the economic system so as to satisfy the present day demands of society without damaging the interests of future generations is true for Russia also. At the same time, during the market transition period in our country there is an evident lack of unity in different organizations' effort to elaborate and implement the educational system in the field of environmental management. The elaboration of management plans of balanced territorial development is common practice in many western countries. In Russia, the economic mechanism of environmental protection is legalized also. However, it is too early to say that it is working at its maximum capacity.

Also you should take into consideration that in the USSR nature protection actions during many years were submitted to political and ideological interests. As a result, many of our industrial centers were turned into ecological catastrophe zones and badly influenced our people's mentality. The people were brainwashed with a destructive idea that 'You should not wait for nature's mercy: to conquer it is our task'. The worst is that this consumption approach towards nature exists among factory managers.

How do we understand "Environmental Management.?" Collins Complete Dictionary of the English Language (London, 1988) defines management as the science, practice and methods of direction and control as well as efficient, rational use of resources and time. In this case, environmental management is an ecologically based system of direction and control.

Environmental management is aimed at the achievement of a balance between the economic and environmental interests in the use of natural resources.

The stimulations for the environmental mechanisms of nature protection activities are, on the one hand, the profound understanding of society and nature laws, and, on the other hand, the joining with an educational system in a unified block of training in the field of ecological and economic management.

The role of environmental management is to investigate a wide range of problems among which we should point out especially the following:

1. Determination of the aim of development which should be achieved by ecologically reasonable management.
2. Determination of a strategy of resource use.
3. Choice of evaluation methods of influence on the environment and the damage of real and/or possible environmental change.

Finally it is necessary to consider some classes of modern Russian nature protection legislation from the view of perspectives and aims of environmental management.

Today we offer our students a course titled "Environmental Management" which has the following sections:

1. Environmental Problems in Modern Business Activities
2. Industrial Safety
3. Economic Evaluation of Environmental Protection Activities in Industry
4.1 Environmental and Economic Effectiveness of Environmental Protection
4.2 Damage of the Atmosphere, Hydrosphere, and Lithosphere Economic Evaluations
4.3 Payments for the Pollution of the Environment and for Industrial Wastes
4.4 Payments for the Utilization of Natural Resources
5. Federal System of Evaluation of the Impacts on the Environment
5.1 The Legislation of the Russian Federation on Environmental Protection and the Rational Use of Natural Resources
5.2 Environmental Assessment of Industrial Projects and Functioning Enterprises
5.3 Decision-making in Environmental Protection and Rational Use of Natural Resources
5.4 Inventorying of Wastes
5.5 System of Environmental Monitoring in Russian Federation
5.6 "Ecological Passport" of Industrial Enterprises

Teachers from our school prepared a teaching booklet for our students titled Environmental Management. It is to be published soon. It has such chapters as:

1. Introduction: Notion of Environment Management
2. Concept of Modern Society Steady Development
3. Natural Resources as the Basis of Society's Well Being
4. Problem of Environmental Impact Limitations
5. Pollution Damage Evaluation
6. Economic Mechanism of Environmental Protection in the Russian Federation
7. Pollution fines in the Russian Federation
8. Ecological Passport of an Enterprise
9. Management as a Plan of Ecologically Balanced Territory Development
10. Conclusion: International Legal Principles of Environmental Protection and Steady Development

This is our first modest contribution to the development of ecological education.

Presently the School is working intensively on creating a teaching program similar to the MBA in the Untied States but adapted to our conditions and aimed at training personnel and managers of private companies engaged in commodities and know-how production. In the program, along with studies of market economy, laws, management, marketing, legal regulations of entrepreneurship, financial activity, information, etc. special attention is being paid to ecologic and economic activity of enterprise.

The aim of this work is to offer to representatives of newly formed businesses in the former Soviet Union countries such a professional training program which would allow them not only to successfully master the habits and skills of enterprise management, but also to learn to work at inner and foreign markets which will show that environmental protection is not only their civil duty but also an economically justified activity.

In conclusion, I would like to invite participants of this conference to take part in a seminar on environmental management which is being organized by our School. We plan to conduct the seminar in June on board a comfortable vessel which will ply form Moscow to St. Petersburg.

PANEL III

Michele Perrault

Many of you who have just come in may have missed the earlier part. Let me just reiterate what the purpose of this symposium is to discuss the need to develop a framework for sustainable development education, and to see how it can be mainstreamed into the U.S. education system. We are also here to discuss the idea of developing a conceptual framework, Chuck Roth, will be describing efforts at defining environmental literacy in general, and more specifically his work on the ASTM Standards and geography standards.

Then Mary Paden will describe the idea of developing simple but deep set of concepts and skills that students will need to create a more sustainable future and infusing these into the mainstream of education.

Mary is from the World Resources Institute, Chuck Roth is a consultant now, and did his former work with the National Audubon in Massachusetts.

Charles E. Roth

The need for some sort of framework of understanding for sustainable development (use) education is an important idea for this field but the field workers are at the beginning, in many ways, of a process that is going to take a long time.

Over the past two decades at least, schools have been dealing with quite a range of what I call "ersatz disciplines." Of course there are the traditional ones, like math, science, social science, language arts, and the like, but schools are presently pressed to add global education, sustainable education, computer education, and you name it. Each of them is vying to become part of "the new curriculum" and each is trying to find a major niche. Friends, it is not going to happen that way. We have to look carefully at where schools are going and how special interests should play a role. I will address that particular question through looking at my experience with developing and environmental literacy strategy for environmental education and apply what has been learned to the sustainable development education concerns.

I have been working on the environmental literacy track since 1968. Back in 1968, there was a great deal of talk about environmentally illiterate people; people who polluted and who threw trash around. So I said to myself, "Well, how do we recognize the environmentally literate person?" I started sending out letters to leaders around the country asking them that simple question. I was not overwhelmed with replies, but I felt that it was an important and fundamental question that needed to be addressed.

Consequently I stuck my neck out and wrote a piece that described an environmentally literate citizen. It turned out to be a description of a paragon of virtue which a supreme deity probably could not have met. That created an implementation hang-up for a long time, but it served to introduce this concept of environmental literacy. The piece was originally printed in Massachusetts Audubon but was soon reprinted in the New York Times.

Much to my surprise, I began to hear this term used in a variety of places. Even though a friend of mine was a presidential speech writer, when I heard the phrase coming out of President Nixon's mouth I almost fell off my chair. Over the years, a wide variety of writers and speakers started using the term in a context of motherhood and apple pie, yet they each meant something different by it. The term eventually, in my opinion, lost much of its value because it meant everything to everybody and nothing to anybody.

In the ensuring years, various other people tried to define it and the field began to absorb the variant and discuss them. When ASTM got together and set up a committee to discuss a standard approach to environmental education, one of the results was to try to operationalize the term "environmental literacy" in order to give it back some value and meaning and use it as the basic goal of environmental education. There have been many problems along the way, but the end result is that there is now, through the ERIC system, a statement on the history, development and purpose of environmental literacy.

At ASTM, the committees have derived a draft guideline standard operational definition of environmental literacy. We have moved away from the original paragon of virtue end product to presenting environmental literacy as a continuum of competencies. Just as there is a difference between being able to read a stop sign and the ability to read Shakespeare, there is a comparable range of capacity in environmental literacy.

We divided environmental literacy into three degrees:

- nominal environmental literacy, in which the individual shave some idea of the key words and basic attitudes
- functional environmental literacy, in which individual shave developed basic conceptual understandings, skills, and attitudes about relationships between people and environment and can apply them to at least one environmental issue that interests them
- operational environmental literacy in which the individual can apply that knowledge and basic skills to making day to day working decisions

Time does not allow further elaboration on these key stages but obviously, you do not do all this overnight. I point this out because when developing anything within the sustainable education community one has to look at different levels of competency. You cannot just jump from early awareness to the paragon. Within the environmental literacy movement we have tried to define the basic knowledge, skill, attitudes, and behaviors that identify these three degrees of literacy. Although our working definition is not cast in concrete, we recognize that any education program has to focus around these four components.

The concepts, skills, attitudes and behaviors of environmental literacy can be incorporated, at least partially, into a range of basic, traditional disciplines. For example, the geography educators, who are developing their national standards for geographic education have created a special committee, including some from the ASTM committees, to be sure that environmental literacy concepts are included in national geography education standards.

We are using the same integrating, infusion approach in Massachusetts to develop our state outcome-based goals. Creating outcome-based education goals means that you get your act together enough to say to schools, "this is what knowledge, skills, attitudes and behaviors we expect students to grasp as a result of schooling". By expressing these concepts as outcome goals and saying "maybe there is a place in your existing curriculum that you want to tackle that particular outcome goal" is better than to saying "we have got to have sustainability education in place, move something over and put this in." Massachusetts is now offering the outcome goals for environmental education to the groups developing a core curriculum for the state and a new science curriculum framework.

A number of different communities of scholarship have gone through a similar process of defining education standards and have come up with similar conclusions. The problem is that they each develop their own rhetoric for it. Since those communities often do not talk with one another as much as we might like, they tend to develop concept sin one area calling them X, while another group is developing the same thing somewhere else and calling them Y. I think the kind of framework being called for by the sustainable development community requires some group to pull these things together and find the commonalties just as we did with environmental literacy.

The goal should be to say in "X Education" forget the adjective in front of it, state that our students must know these things; these are our outcome-based goals. Then fight to get those outcome goals into the curriculum whatever the course may be called, and under whatever structure they happen to be developed.

I feel that the basics of sustainable development education currently exists in environmental literacy documents. I urge sustainable development education advocates to study them. My impression is that the literacy projects are articulate; the skills and attitudes that students need to deal with any environmentally related issue. This is the fundamental base, and it may be even more important than setting up concepts around sustainability.

I further suggest that sustainable development education, like global education and others of the "ersatz curricula" that I alluded to earlier are basically issues to be addressed by education using basic environmental literacy knowledge, skills, attitudes and behaviors. More pressing for sustainable development education is to create a framework of key questions to be addressed by classrooms using environmental literacy competencies. Questions about the relationship of humankind to the world. Such a framework might include:

- How can people use the resources of the planet without significantly reducing the resource base for future generations?
- How can there be development that provides advantages to one group without seriously disadvantaging groups elsewhere?
- What is the carrying capacity of a region under discussion under current appropriate technology?
- How can human populations be adjusted to the carrying capacity of any particular region under discussion?

Such questions should form the basis of our educational framework. Addressing such questions and others in such a framework on a regular basis in a variety of educational settings should result in much improved sustainable use education. From the point of view of education, our goal is not to tell students what to think, but to teach them the skills, and to frame the big questions. What is currently left out of the curriculum is a statement of the high priority questions that require answering through the application of basic knowledge and skills of environmental literacy.

Mary Paden

First, I would like to mention a bit about my own background, and what brought me to the point of wanting to see some integration of environment and development education. I studied in mid 1970s at the University of Michigan under Bill Stapp and I see myself as coming from the environmental education movement. I have also worked for eight years at the World Resources Institute, where we address both environment and development issues on a global basis. It is very clear to me from having worked there, and having worked on these issues, that there is a very natural and obvious integration between environment and development education.

The social justice movement and the environmental ethics movement are also major threads that we are proposing be woven together into a fabric, or a framework, that would set out a vision of what students need to learn in order to make a more sustainable 21st Century. That is how I frame the question: whether you want to call them standards, outcomes, goals or questions does not concern me right now. What does interest me is whatever comes to your mind in answer to the question "what do you want your children to be learning now in order to create a more sustainable 21st Century?"

First, I would like to address why we should bother coming up with a framework, because, as we see from the panelists, these things are already being taught in various places, in various pockets. Then, I would like to propose that this framework be tightly woven into the mainstream of education. We don't need another side-dish education movement promoted by NGOs and dimly understood by educators. I believe that we have an incredible opportunity to move sustainable development into a more central position in public education in the United States. At yesterday's keynote address, I heard Madeleine Kunin, deputy secretary of education, propose environmental literacy for all children. Imagine that! I have never heard a federal education official say anything even close to that before. Both environment and development education have always been conducted on the fringes, with little recognition from the mainstream.

Finally, I will talk about the possible form and shape of such a framework.

Why should we create a framework? Why not go on as we are with everybody doing their own thing while students pick and choose, perhaps finding their own vision? I have been reading some of the reports on environmental education produced by countries as part of their state of the environment reports for the Earth Summit Conference in Rio last year. The report from Belgium is a typical description of environmental education.

"There are many environmental activities, but they are scattered and irregular, little or not at all evaluated, and they are run by a great variety of people and organizations who are barely aware of one another's existence. Each demands the support of public authorities and the attention of the media. They are obviously in a precarious position, and resources are too thinly spread. There is substantial duplication of education materials on some topics and conspicuous gaps in others. Because there is no clearly fixed point of reference, all manner of activities relating to nature where the interest is purely ecological or naturalist, tend to be included in environmental education. Voluntary organizations and societies dominate the scene, and the schools are very much in the background. There are undeniable gaps in both initial and in-service teacher training. The universities are playing a minor role, and a specialist center is badly needed."

Here is a statement by a group of "big thinkers" who were brought together in Colorado by a Rockefeller grant a couple years ago to look at environmental education materials from around the world, "the best designed environmental education materials or teacher training programs which stand little chance of having an impact in the absence of meaningful policy reform which raises the stature of environmental education within a school's overall syllabus and academic program."

The following passage was included in the 1993 annual report from the U.S. National Environmental Education and Training Foundation, "only a limited number of people, both education professionals and laypersons share a common and systematic understanding of what constitutes good environmental education, and how important it is to the public interest. Most fundamentally then, there is a need for a well defined, widely accepted set of definitional parameters, which could stimulate consensus building and promote greater clarity of purpose and accomplishment to the field." I like that, maybe we should use that phrase--"definitional parameters."

In the past 20 years since Stockholm, we have developed a great many bottom up efforts that have been effective locally. But we have failed to penetrate the mainstream of education systems around the world. Working on the fringes has allowed us to be creative and innovative, but it has not allowed us to reach the majority of students. For that we also need a top down approach that involves getting sustainable issues on the agenda of mainstream education through a framework document that clearly states concepts and competencies that should be taught.

The major disciplines--the sciences, social studies, geography--have been creating their own frameworks, or performance assessment standards over the past several years. I would like to read a few of these standards that might feed into our set of "definitional parameters."

This one is from the science teachers, the National Science Education Standards an Enhanced Sampler from February 1993: "likewise in the arena of environmental issues, students' understandings of the chemical basis of life, the molecular basis of heredity, and the nature of the flow of matter and energy and biological systems, all provide some of the scientific understanding and knowledge that students will need to make informed decisions about their environment." Now this is very scientific, very systems based. Some environmental educators may argue that there are more steps than the science teachers envision involved in translating scientific knowledge into anything useful in the voting booth.

In the ASTM Standards that Chuck Roth spoke about, the very lowest level of environmental literacy adds to the scientific understanding of systems an "attitude of respect for natural systems, and concern for the nature and magnitude of human impacts upon them. It talks about the "rudimentary knowledge of how natural systems work and how human social systems interact with them." So the environmental educators bring in the scientific understanding, and add an understanding of how humans interact with those natural systems, plus some respect for these processes: a values component.

The global educators contribute the following points: they call for a "perspective consciousness"--which is the "recognition or awareness that one's view of the world is not universally shared and that it has been and continues to be shaped by influences that often escape detection, but that others have views of the world profoundly different from one's own, and that one be able to project oneself into other perspectives." To what we have about natural systems and human interaction with them, the global and development educators tell us that there are many kinds of humans, many perspectives, and much diversity there too that we must understand. They talk about "cross-cultural awareness and competence."

The social studies teachers include an emphasis on citizenship skills. The National Council of Social Studies (NCSS) curriculum guidelines assert that "the basic goal of social studies education is to prepare young people to be humane, rational, participating citizens in a world that is becoming increasingly interdependent." It also said that "citizenship participation and public life is essential to the health of our democratic system. Effective social studies programs help prepare young people who can identify, understand and work to solve problems that face our increasingly diverse nature and interdependent world."

The NCSS adds to our pile of concepts a sense of citizenship skills, the ability to understand how social systems work, and the ability to participate, to interact and to influence those systems. I think that is part of environmental education, too, but articulated in a different way.

I see this broad framework including--and I am not even going to try to phrase any of these things--the following components:

- A basic understanding of ecosystems and how natural systems work
- A multi-cultural perspective. It is not just humans against nature, it is many different cultures
- An attitude of respect for both nature and human dignity. I do not think that we would be successful coming out with something that sounded like a religion or a particular train of ethical thought, but I think that ethics and values need to be addressed in here somehow
- A geographic understanding of the world
- An understanding of technology and its interaction with society. Nor can you ignore the effect of technology on the environment, and its promise to overcome some of its bad effects
- A historic perspective is important, not only of geologic and environmental history, but also the history of social change. I think that students often become very frustrated--they try something and it does not work, even with as little as two weeks effort, they give up. I think it is very important for kids to have a sense of previous social movements and social change, and that values and perspectives do change over time
- Research and analytic skills are a crucial part of the framework. Environmental education has been criticized in a number of magazine articles and in an editorial in the Washington Post recently about being too advocacy-action oriented, without enough hard science and good analysis, etc. Of course you must have both good analysis and good political action: this is not an either/or situation. I think the best political action is based on sound scientific evidence and sound reasoning, and we would do kids a great disservice if we told them how and what to think and to run out and do things for the environment because their teacher told them to do it.

> It is crucial that we teach kids good analytic skills; how to look at data, how to compare secondary sources to primary sources, how to look at different arguments and figure out what is logical as opposed to what is not, how to make a good guess at who is telling the truth.

The form that I see the framework taking is not a big study, in fact, it is not a report at all. I would like to see it articulated on a poster, with a set of principles or points, under 20 in number. It should be modeled, and this may seem presumptuous, on the Twelve Steps or the Bill of Rights--lists that any person, any school board member can read and understand. Of course there will always be reports, but if we could derive a statement that was simple, deep, and clear enough for school board members, educators, students, and parents to digest we would have a basis for developing programs and curriculum.

Creating the statement will require a great deal of cooperation and discussion. I see this perhaps coming about through some symposium of leaders, teachers, and students. Talbert Spence had a wonderful idea in which the "elders" or "wise people" from the environment and development movements come together in a room along with a group of students to hold such a discussion while all of us middle-aged professionals listen. Whatever would come out of this process of discussion would then have to move on to a wider arena. It would have to come here to the NAAEE Conference, to schools, the geography teachers, but rather a focus for a beginning. The final statement could then be used on a school, district, state, or national level as almost a checklist. The ideas in the framework would be woven into the curriculum.

Michele Perrault

The international non-governmental treaty process and the recommendations in Agenda 21 on education ask that we think about world sustainability and what changes it would require in education. Some of the things that have been discussed in this last panel. We need to ask some major questions:

- What kind of society are we educating the children for?
- What kind of world do we want? At the same time we need to acknowledge that it is more important to empower learners to come up with their own solutions than to give them ours
- What kinds of knowledge skills, values, attitudes and behaviors will learners need to acquire?
- What kinds of institutions, education and otherwise do we need to foster a just and ecologically sound society?

A book put out by the Association of Supervision and Curriculum Development in 1991 pointed out the need for teachers to have a clearer vision of the role of the school in today's changing world. It focused on global education, which involves learning about these problems and issues that cut across national boundaries, and about the interconnectedness of systems; ecological, cultural, economical, political and technological. It involves perspective taking, seeing things through the eyes and minds of others; and it involves the realization that while individuals and groups may view life differently, they also have common needs and wants. That is an encouraging statement, and I think we need to take those kinds of documents, and the kind of thinking that has been going on within those disciplines and move forward with them for any changes that need to be made for the better in our educational arena. Of course others say too that you cannot do that unless you transform the schools themselves, which are blocked into individual disciplines, without allowing enough cross-disciplinary activities.

Joelle Danant of American Forum for Global Education who unfortunately could not be here today, said that the challenge for educators is to demonstrate the interconnectedness of environment and development issues. We can no longer afford to have a fragmented view of the world. No longer can we look at the environment as disconnected from its habitants. Problems of poverty and the environment are spreading. It is crucial for educators and learners to be exposed to and engaged in a more comprehensive context of the challenge and opportunities that our times offer. It is vital for our learners to understand how the these issues and policies affect educators for them to fully grasp and articulate the links among these global issues. No effective and lasting problem solving can take place in the United States or elsewhere without them.

I think this panel has been addressing these kinds of things and questions that have to be asked and each one of you can play a part in furthering this discussion. We have passed around a list of the conference participants, and we ask you to circle your name if you are in the room so we can continue a dialogue and network, and you can be brought up to speed as these things move along. I think that is important otherwise it stays within the conference room.

I would like to point out from the document I opened the Conference with called "Making Common Cause Among the Environment, Development and Population Groups" from 1985. They had a public education plan, and they discussed the importance of five points, which I also think summarize the kinds of things we have been hearing among educators that talk today:

1. to convey information and knowledge from the most accurate and current sources;
2. to provoke concern for equity and justice, understanding of individual aspirations and respect for indigenous cultures and traditions;
3. to demonstrate the relevance and importance of our issues to the quality of life and security of our citizens;
4. to stimulate individuals and community groups to accept the aim of improving quality of life, and eliminating the root causes of poverty and hunger in the third world as priority U.S. policy goals; and
5. to suggest wide ranging options for action so that individuals and groups who want to can become meaningfully involved.

Symposium X: Continuing the Quest: A Focus on Environmental Education Research

Rick Mrazek, The University of Lethbridge
Lethbridge, AB

Through excerpts drawn from my contributions to Alternative Paradigms in Environmental Education Research (Mrazek, 1993) I hope to provide a background to the papers and discussions presented in this symposium, which is a continuation of the quest or search for answers to many questions raised earlier about environmental education research. As suggested in the monograph, it is a quest not unlike the journey undertaken by knights in search of the Holy Grail in medieval times. It began with questions raised in 1989 at the North American Association for Environmental Education conference held in Estes Park where discussions at the North American Commission for Environmental Education Research meeting focused on the types of research being made available and promoted by various journals and publications. At that time there was considerable doubt expressed concerning the match between timely areas of research and those which were being promoted. As a result of this, Ian Robottom, Paul Hart, and I put forward a proposal for a symposium to be held at the 1990 NAAEE conference to be held in San Antonio, Texas called Contesting Paradigms in Environmental Education Research. John Disinger and a number of other individuals involved in environmental education research helped identify individuals in addition to the North American Commission for Environmental Education Research membership who may be willing to take part in the symposium, others involved in environmental education research that would be interested in knowing more about these efforts, and those who may be able to provide some insights as to the types of questions that should be raised in such a symposium.

The symposium was to provide a forum for considering and appraising alternative approaches in environmental education research. Some of the topics to be addressed were

1. What is the nature of alternative paradigms in environmental education research?
2. What is the history of these traditions?
3. What are some of the assumptions these differing paradigms make about the relationship between theory and practice?
4. What assumptions are made about the four common places of education--teachers, learners, subject matter, and milieu?
5. What differing methodologies are favored by these approaches?
6. What is or should be recognized as the professional status of practitioners in environmental education research?
7. What differing interpretations of such notions as rigor, validity, and generalizability are made by these alternative paradigms of educational research?
8. What should be the role of a professional education journal in providing a forum for discussing questions similar to those listed above?

At the time a concern was raised that the term "contesting" represented conflict and therefore the title of the symposium should be "Alternative Paradigms" rather than "Contesting Paradigms". In an attempt to communicate that the symposium was meant to be as inclusive as possible without intimidating anyone that might be interested, the change was made. Ian Robottom suggested in his contribution in Alternative Paradigms in Environmental Education Research there are some educational concepts, and this may be one, which are necessarily contested and should be the subject of continuing critical discourse and debate. The reader will be left to make that decision. Based on the information mentioned earlier, initial presenters and reactors were identified for the symposium. The symposium was structured in such a way that initial overview presentations were made by Paul Hart, Diane Cantrell, and Tom Marcinkowski reflecting different ways of viewing and approaching research in environmental education. The morning session used one-half hour presentations to focus on empirical studies, interpretive studies, and a critical approach to research. Following this, three reactors, Ian Robottom, John Disinger, and Esther Railton-Rice responded to these initial presentations. Their job was to react to the three main papers and set the stage for small group discussions in the afternoon. These small group discussions were then followed by a plenary session which attempted to provide a summation and future directions regarding environmental education research. It was hoped that from this plenary session suggestions would come forward for potential research networks, collaborative efforts and/or proposals which may involve a greater number of NAAEE members. Some of the themes which came out of this section included a need for continuing our quest to look at the consequences of research as well as the different interpretations of terms being used such as "rigor". It was quite obvious that language became problematic. There was confusion between philosophical derivations of paradigms and the need for more emphasis of the specific questions being asked.

One of the major points upon which all those present agreed was that there was a need to involve more people in this discussion. This seemed to lead directly to the 1991 monograph proposal dealing with paradigms in environmental education research which had been proposed by Paul Hart and myself. Possible contributing authors were viewed initially as the participants from the 1990 symposium as well as interested members of the North American Commission on Environmental Education Research. In order to solicit a wide selection of opinion and array of issues associated with this topic, letters were sent out to individuals identified with a potential interest in contributing to the monograph, as well as soliciting contributions through the Environmental Communicator. This became an ongoing process as the monograph took shape. A serious attempt was made to take into consideration cultural differences in ways of viewing environmental education research by soliciting papers from as many countries as possible.

From this point the structure of the Monograph evolved from an attempt to share the presentations and ideas resulting from the symposium into a contribution which would grapple with the complexity of defining environmental education research in such a way that it would **invite participation** in the discussion and carry forward the quest to address the initial questions raised in the symposium to more members of the NAAEE.

It is suggested at the beginning of the monograph that the reader may be embarking upon a journey or quest for an environmental education research paradigm that could be responsive to the present and future needs of environmental education and its practitioners. Along this path one encountered contributions which might serve as signposts addressing the nature of paradigms in environmental education research, assumptions regarding theory and practice as well as interpretations of such notions as rigor, validity, and generalizability in research. The question the monograph left us with is, does such a paradigm exist and have the signposts encountered to that point directed us to it? Is this paradigm only philosophical rhetoric bantered about by a few or is it steeped in realities which have as their center the problems and issues investigated in environmental education research? Subsequent discussions at last year's ECO-ED conference in Toronto echoed requests for more examples of research being conducted and continued discussion of research integrity and relevance.

Some would be drawn to a more philosophical discussion of these. One line of discussion within this deal with difficulty. In any research in which I engage, I encounter a number of difficulties. Some of the more superficial ones can be easily named while others are of a much more significant deeper nature. Initially there is the problem of finding a suitable, meaningful topic and deciding on my approach to it. Though I may have my particular position vis-a-vis my research orientations, this is not necessarily established or set for this particular problem. The way I perceive my research question may continually be evolving. The difficulties involved with my research question may, on the one hand, bring a sense of challenge to persevere and overcome it, yet, on the other hand, an anguish that I may not be able to accomplish or achieve what I have set about to do. If difficulties are removed, is not the necessity to struggle with the problem or strive to move beyond also removed? In terms of our research does this then mean promotion of a more superficial way of answering potentially complex questions? What are the implications of a positive correlation between integrity and difficulty? Some maintain that life without the chance of difficulty is an impossibility so that what we are actually looking at in many cases is how we approach different levels of difficulty. The threads begin to tangle as we now are dealing with our personal philosophies of life ranging from one's personal views of environmental education research and to consideration of ourselves as human beings engaged as practitioners within that area.

This symposium will take a more pragmatic approach to the requests of the last year by providing a variety of research examples and attempt to learn more about some of the people who engage in environmental education research.

Expanding EE Research Potential

Rosanne W. Fortner, The Ohio State University

I. A model of EE programmatic research and development interaction, with expansions into research contributions to the field

In NAAEE Monograph VIII on Alternative Paradigms in Environmental Education Research (Mrazek, 1993), Mayer and Fortner (pp 249-271) describe techniques used to turn a fairly typical programmatic sequence of curriculum development and teacher education into a model of how research and development can interact for real contributions to environmental education and research. Briefly, that model is characterized by research intentionally designed to advance EE theory and practice while meeting the needs of program sponsors and the home institution (Ohio State University). Research and evaluation activities therefore had to go beyond the standard in-house, pretest-posttest forms of evaluation for demonstration of accountability to a funding organization or administration (Section I of Figure 1).

Figure 1. Research and Development Interaction: The Ohio Sea Grant Education Model

Program phase	Research/Evaluation
Generating ideas for curriculum topics	Needs assessment: interviews of stakeholders Statewide test of K & A
I. Effectiveness of Components	
Curriculum development	Pilot test: pre-post Qs, student and teacher interviews, observations; Scientist and science educator review
Teacher education (dissemination) Workshops, Museum program	Workshop evaluations during and after programs; follow-up from participants
II. Effectiveness of Model	
Curriculum materials knowledge	Intensive time-series test of impact on
Modes of delivery	Survey of groups involved in each delivery type, for levels of curriculum use and sharing
Student knowledge & attitudes Grades 5-9 (1979, '83, '87)	Longitudinal study, statewide survey in target

Beyond these techniques, the authors examined the overall model for what it could demonstrate to environmental and science educators who are engaged in similar work (Section II, Figure 1). What customarily begins and ends with formal testing of curriculum materials among the target audience of students was expanded to become a test of how infusion materials might work if all those related to a single topic were assembled into a unit for teaching. The premise was that students need more time than single infusion lessons normally take in order to assimilate information about a topic. For this study, Mayer and Raudebaugh (1987) applied a newly developed intensive time-series design and tested students daily before, during and after a four-week earth science unit that used infusion-type materials developed in the program.

To expand the value of the teacher education efforts used to disseminate the materials, Mayer and Fortner (1987) compared the effectiveness of the four dissemination processes: short workshops, long workshops, museum program with materials as handouts, and mail orders. Criteria for effective dissemination were based on personal use of the materials, and telling others about the materials. Results indicated not only the value of short workshops and mail orders but also provided information on the different demographics and possible motivations of teachers who participate in short versus long workshops. This information is valuable to teacher education programs when decisions must be made about the best use of small budgets for dissemination.

As for impact on students, Fortner and Mayer (1991) twice repeated their baseline survey of student knowledge, attitudes, and information sources (Fortner and Mayer, 1983) to monitor changes in the target population. Not only did knowledge increase and attitudes improve, but information sources changed from a focus on television and movies to a classroom source instead.

Since the best research not only answers important questions but generates new ones that are equally exciting, the authors have continued to use the student data on information source to devise experimental and quasi-experimental research testing those sources. Equally important to environmental education is the fact that all these studies have been reported in the professional meetings and research literature available to practitioners. This is the only way that local efforts can make effective contributions to a global profession.

Mayer and Fortner (1993) acknowledge that use of qualitative designs could make even greater contributions to the understanding of the impact of their 15-year program. "To be familiar with numerous educational research designs is to be alert to opportunities for their use, and to know their limitations. ...the authors acknowledge that new methods of qualitative evaluation can expand the information available and assist in identifying future program directions" (p. 269).

II. Immediate needs for the improvement of EE research

As a teacher of graduate students in research courses for environmental communication, education, and interpretation, I have watched trends in that research over the years. It takes only a quick review of methodologies summarized in NAEE Monograph II (Iozzi, 1984) and a year's issues of JEE to become aware that EE research has been survey-bound and quantitative for decades. The Alternative Paradigms monograph should serve as a stimulus to EE researchers to consider different ways of learning about and contributing to the field. It should also indicate to the profession that the time is right to break out of traditional modes of inquiry, to improve those modes if we must continue to use them, and to look beyond environment and education for sources of inquiry that could enhance our own.

As a start, EE researchers should seriously consider these needs:

- Improve instrument design. If you must use a survey, look beyond the standard EE "panel of experts" to review it. Consult college researchers on proper instrumentation and especially on appropriate use of statistical analysis techniques. Poor survey items, analyzed with inappropriate statistics, misinform practice and damage the credibility of the researcher.

- Consider gathering data in non-numerical ways. We hear often that if your only tool is a hammer there is a tendency to view every problem as a nail. Many EE researchers were trained with survey research as the method of choice, and we have used surveys to seek answers in a way that was satisfactory to us. Now there are many research tools available. Consider whether a non-numerical approach could answer your question. Case studies, content analysis, concept mapping, oral history, interviews and other verbal data offer a richness of information that may enhance your understanding of program impact beyond those quantitative variables we customarily seek.

- Embrace other disciplines as legitimate information sources. Alternative Paradigms effectively demonstrates the value of considering such work for its role in enhancing the profession. EE as a research field is immature and its list of contributors has been very fluid (i.e., since most EE research is done by practitioners, it has sometimes been seen as a requirement to be dispatched hastily in order to get on with the "real" work of the profession). The cadre of continuously contributing EE researchers is small, and they tend to be based in or affiliated with other professions that have greater longevity.

There is much to be said for what other disciplines can contribute to EE research. To use only "environment" and "education" as the key words in a literature search is to condemn your research to navel studying. A behavior model that does not incorporate research from the behavioral sciences and psychology is a naive model. Seek out the work of the following fields and others for precedents that can inform EE theory and practice:

Ethics
Science education
Cognitive psychology
Psychology (general)
Public relations
Leisure studies
Philosophy
Geography education
Behavioral sciences
Educational technology
Communication
Sociology
Marketing
Journalism
and many more!

In addition to the works reported in Alternative Paradigms, recent research by Rosser (1992) and Meredith (1993) at The Ohio State University, both to be reported in the literature soon, effectively demonstrates the value of opening EE research questions to contributions from psychology and behavioral science. Numerous examples from other sources are available in abstracting services of the other professions listed.

- Contribute to those information sources, both as a new outlet for your research manuscripts and as a means of making EE known to others who might contribute to our profession as well. EE will grow from your efforts, and you may find that you enjoy the new company! An old Girl Scout camp song goes, "Make new friends, but keep the old. One is silver and the other gold!"

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Recent Developments in Environmental Education in Canada--Local Initiative with International Implications

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Introduction

The purpose of this paper is to provide a perspective on the ongoing struggle to incorporate environmental education into the Canadian education system. Recent initiatives in the areas of education and environment are described in order to establish a rationale and a context for Canadian environmental education activity. The paper then raises the issue of the relationship between the intentions of large-scale policy documents advocating sustainable development and environmental citizenry and the realities of current educational practice. It is argued that the educational foundations of Canada's conservation strategies intend far more profound changes to the education system than notions of incorporation imply.

A Context for Environmental Education

When I was preparing a paper for the UNCED conference in Rio, early in 1992, Andre Guay of Environment Canada sent me a document that described progress on Canada's "Green Plan," a six-year, three billion dollar national action plan for the environment during its first year. The document quoted Canada's Environment Minister, who stated that the federal government had announced or begun work on 36 major initiatives, including a federal waste reduction plan, a pulp and paper regulatory package, a Canada/US Air Quality Accord, an energy efficiency act, and a research program in environmental studies for Canadian universities.

Canada's Green Plan was prepared by the Government of Canada in 1990 following cross-country consultations with thousands of citizens and stakeholder groups. In the *Summary* booklet, the Prime Minister described the Green Plan as an expression of federal commitment to manage resources and encourage sensitive environmental decision making-as a commitment to our *children*. Although participants in the Green Plan consultation sessions (Government of Canada, 1990) recommended that the federal government develop and implement a national environmental education strategy, the Green Plan does not contain an educational component. Because education is a provincial jurisdiction within Canada, the federal government has been reluctant to prescribe or to mandate or to even propose change in education.

On the provincial front, at about the same time in 1992, I was working on a provincial committee charged with the task of developing "an education strategy for sustainable development in Saskatchewan." The committee was an education advisory committee to the Saskatchewan Round Table on Environment and Economy. In 1986, a National Task Force on Environment and Economy (established by the Canadian Council of Resource and Environment Ministers [CCREM]) had initiated dialogue on environment-economy integration among Canada's environment ministers, senior executive officers from Canadian industry, and representatives from environmental organizations and the academic community. This Task Force did not shy away from the educational recommendation that the nation's children be given substantially improved environmental education at the elementary and high school levels. The Task Force also recommended the creation of National and Provincial Round Tables for the purpose of developing "conservation strategies" in every Canadian jurisdiction.

The subsequent creation of Round Tables on Environment and Economy resulted in more provincial activity directed toward environmental education. For example, the Saskatchewan Round Table's Education Advisory Committee developed a specific education strategy which included a mandate for environmental education. Similar education documents and materials were, and continue to be, developed within each province and region of Canada. Key recommendations in the Saskatchewan education strategy included the following: incorporating environmental education and sustainable development concepts and values into all curricula and programs within the formal education systems of the province; identifying, promoting, and practicing effective instructional approaches that promote environmental education in the professional development of teachers; and ensuring that public education programs meet the continuing need for environmental citizenship education.

The concept of environmental citizenship is found in a number of government documents in Canada. For example, in preparing for a recent Trilateral Meeting on University, Community, and Environment in Mexico City (an event proposed in the Memorandum of Understanding among Canada, the United States, and Mexico, signed in September 1992), I found the following statement in a March 1993 Trilateral Committee paper entitled, "Proposal for an Activity Under the Trilateral Memorandum of Understanding on Environmental Education":

> In the Trilateral MOU, environmental education is defined as "a permanent process in which individuals and the community gain awareness of their environment and acquire the knowledge, values, skills, experiences, and also the determination which will enable them to act-individually and collectively-to solve present and future environmental problems." Environmental literacy is described as "a basic functional education for all people, which provides them with the elementary knowledge, skills, and motives to cope with environmental needs and contribute to Sustainable Development" (Article I-Definitions). The term "sustainable development" has been the subject of much debate, both in Canada and elsewhere. Rather than get into a semantic/philosophical debate on the scope of environmental education, the Canadian delegates propose that the all-inclusive term *environmental citizenship* be adopted as the goal that environmental education should address.

The Canadian delegation, familiar with the rhetoric and the political nature of the term *sustainable development*, consciously chose to adopt **environmental citizenship** as the goal.

In my view the environmental citizenry goal is consistent with environmental education thought as it evolved from the Stockholm conference, through the Tbilisi Declaration, the Belgrade Charter, and the aspirations of the North American Association for Environmental Education (NAAEE). During the 1980s, environmental education continued to be recognized as an essential component in the resolution of environmental problems. However, with wider involvement of groups from business and industry the term *sustainable development* began to appear as an alternative to *environmental education*.

Canada is a large country with geographical barriers and cultural differences. It will be interesting to observe how this tension among slogans embedded within the rhetoric of national and international documents is translated into school programs in each region. Obviously, communication will be important as we move to incorporate our notions of "environmentally appropriate" education.

More Recent Developments

Where are we in 1993? Canadian environmental educators are actively involved in many projects spawned by federal initiatives. But can we say that environmental education is infused into the educational thinking and planning activities of Canada's teachers, generally? McClaren's (1989) concern that, because of the separation of federal and provincial responsibilities for public education, federal rhetoric is rarely translated into local action, remains. Despite the clarion for environmental citizenship based on environmental education aimed at fostering a new environmental ethic, environmental education is not an integral part of each child's education in Canadian schools. Although Saskatchewan has included a science-technology-society environment (STSE) dimension of scientific literacy in a new provincial science curriculum and Alberta has a very active Friends of Environmental Education Society of Alberta (FEESA), and despite the work of a small army of committed individuals working locally in many regions of the country to build environmental education within provincial schools and nonformal sectors of education, in the words of one national leader, "We have a lot of work to do."

Earlier this year, through an initiative of the Canadian Teachers' Federation, Environment Canada and UNESCO-Canada's Man and the Biosphere education network, a widely representative group of educators assembled in Merrickville, Ontario to establish a new Canadian network for environmental education under the acronym EECOM (the Canadian Network for Environmental Education and Communication). EECOM was conceived for the express purpose of improving environmental education communication and networking within Canada. It has established several working groups in areas of constitution drafting, fund raising, and electronic networking. An interim Steering Committee is working toward regional meetings as well as a national meeting in 1994 or 1995, perhaps in the province of Quebec. I believe that the work of EECOM and of environmental educators in Canada is crucial to our country's goal of an environmentally literate citizenry. The policy documents have been developed to impel us toward that goal. However, incorporation of environmental education into our school system is another matter-a matter of provincial education planning.

Conclusion

As a Canadian environmental educator, I suppose that I should be encouraged by international and national developments that, in effect, increase the pressure on provincial education departments (ministries) to act on policy initiatives. From formal submissions to the World Conference on the Human Environment in Stockholm in 1972, through Agenda 21 of the United Nations Conference on Environment and Development in Rio de Janeiro (1992), countries have been encouraged, poked, and prodded to integrate environmental issues into existing curricula. While the current level of activity is encouraging, I am not certain that broad incorporation of a concept such as environment education is possible through standard curriculum development and implementation channels.

The problem remains that although Canadian commitment to global environmental quality seems impressive, perhaps exemplary, our track record of successful implementation of educational change is questionable. As McClaren (1989) states, "a lack of ongoing federal, provincial, or local school system support for innovation in terms of coordination, professional development of teachers and implementation is evident." I have argued before (Hart, 1990) that failed implementation stems from fundamental deficiencies in our dominant (RDDA; research, development, diffusion, adoption) models of curriculum development-deficiencies that assume independence between policy setting and school practice so that the operational form of an innovation (practice within existing school patterns) is incapable of meeting its rhetoric (theory). Unless we reconceptualize this curriculum development process, we may think that we have accomplished much more than our children are able to experience.

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Ecological Literacy, Great Books, And Some Thoughts On Environmental Education Research

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Examining research in environmental education was encouraged by the NAAEE's 1990 research symposium on this topic (Mrazek, 1993). The symposium title, originally "Contesting Paradigms in Environmental Education Research" but later changed to "Alternative...", is a good starting point for more discussion. Both titles indicate contention about the relative merits of various research traditions and, the symposium gave prominence to this contention.

Consider the implications of these titles. First, talking about "contesting paradigms" suggests that various research traditions are struggling for prominence. It is easy to imagine advocates of junior paradigms trying to oust the dominant one. Second, "alternative paradigms" suggests that researchers can choose from more than one research tradition, and that one may be as good as the next.

I am troubled by these implications. It is not clear that the word "paradigm" is useful, or even applicable when discussing research in the social sciences or education[1]. I think that education reflects its non-paradigmatic quality by virtue of its diverse research traditions and the variety of different questions it poses. If this is true, and if differing questions appeal to different research traditions, then pursuing paradigms might get in the way of more fundamental requirements. I suggest that environmental education researchers must first examine the *nature* of their questions, then seek suitable approaches to research. I fear that too frequently the reverse procedure is applied: the researcher settles on a research tradition, or "paradigm," then seeks a question to answer.

In this paper I examine a number of contemporary, and frequently undervalued, research questions and discuss associated research needs. To give substance to the discussion, I talk about Allan Bloom's widely read, yet controversial book, *The Closing of the American Mind* (1987), and David Orr's (1992) response to it in his book *Ecological Literacy*.

Like others, I find Bloom's exposition of education ills grumpy, lugubrious, and insensitive. As Orr says: "He sounds rather like a fussy museum curator, irate over gum wrappers on the floor." I also agree that there are substantive problems with some of Bloom's ideas (for example Orr, 1992; Aronowitz & Giroux, 1991). However, before we cast him aside it is as well to consider some of his observations.

I first read Bloom as I struggled with my own frustrations in environmental education. On a number of points, he offered immediate appeal. First he gave prominence to ideas, ideas about what is right and good. He argues that understanding ideas is a philosophical task which entails evaluating arguments, struggling with disagreements, and constructing new arguments as part of an on-going quest. Preparing students for this philosophical task is, he claims, woefully overlooked. It is further hampered by students ignorance of their heritage and "lacking the wherewithal to be inspired by it or seriously critical of it" (Bloom, 1987, p. 56). The content of their education is important, and students frequently lack sufficient substantive content to engage in important questions about "rightness" and "goodness."

Second, I was interested to read Bloom's critiques of educational institutions' responses to social needs. He makes the provocative claim that many of these attempts tend to be superficial. Finally, his tirade against relativism provides further challenges. While openness to new and different ideas may be important, Bloom argues that all ideas are not of equal value and that unrestrained openness to alternative ideas extinguishes the search for a good life. If, for example, all ideas are considered equally important, or equally deserving of respect, then it is impossible to give prominence to some while rejecting others in pursuit of goodness. For the balance of this paper I will interpret aspects of environmental education research in light of Bloom's observations, consider criticisms of his work, and speculate about research needs in environmental education.

What is Good?

Much research in environmental education has asked important questions like: How can we achieve environmentally responsible citizenship? However, it has never been made sufficiently clear what such citizenship entails. The term "environmentally responsible citizen" carries many positive connotations. When faced with an environmental decision, the responsible citizen will be concerned with questions about what is "good" and "right". And, I think it can safely be argued that enabling students to make autonomous decisions about what is good is important to education. However, ideas about the "good" and the "right", and hence "environmentally responsible citizenship" are not static and represent no absolute truths (Jickling, in press; Stevenson, 1993). Rather, they are about changing ideas, shared understandings, and arguments of greater merit.

Unfortunately, application of empirical techniques to questions about the nature of environmentally responsible behavior miss the point. While science can answer questions about the nature of observable behaviors, questions about what *is* the case, it is not clear that science can contribute substantially to more fundamental questions about values, questions about what one *ought* to do. Attempting to reproduce observable behavioral traits modeled by Sierra Club members or similar activist populations will not do (Sia, Hungerford, and Tomera, 1985-86).

A responsible citizen making a decision about an environmental issue is engaged in a value judgment. And, fundamental to these judgments are questions about who we are, our attitudes towards nature, and values that will enable us to create a better society. Having argued about such premises, there are questions about how these should be interpreted in specific instances. We must prepare students to participate in arguments about values and ethics. These are all elements of environmental education that are overlooked in attempts to produce behavioral clones.

Research in environmental education must seek to escape the "technological smorgasbord" that Bloom (1987, p. 59) has so often observed in the current school system. To do this we must seek greater understanding of the nature of ethics, environmental ethics, and appropriate relationships between these concepts and education.

Issues and Education

Contrary to Orr's suggestions, I believe that Bloom is concerned with everyday issues and students' ability to grapple with them. Bloom states, that "starvation in Ethiopia, mass murder in Cambodia, as well as nuclear war, are all real calamities worthy of attention" (1987, p. 84). Elsewhere he speaks about the connection that real learning has with one's life. However, Professor Bloom is also worried about a plethora of shallow attempts to address these everyday issues. The dangers of these attempts, if not well taught, are "trendiness, mere popularization, and lack of substantial rigor" (1987, p. 343). He may have a point.

I have argued, for example, that pursuing goals such as problem solving, or sustainable development education, frequently underestimates the enormous complexities involved in such activities (Jickling, 1991& 1992; see also Stevenson, 1993). At the heart of these issues are questions about what constitutes a problem, what is sustainable development, and what is good for society and our environment. Critical reflection about values which determine social acceptability is essential to clear thinking. Unfortunately, concentrating on problem resolution, or implementing sustainable development, can distract from these fundamentals. If we are to avoid the shallowness that Bloom talks about, we must resist temptations to over-simplify, and even trivialize, important issues. Bloom's misgivings should suggest research questions for environmental educators.

Relativism

Just as Bloom is concerned about relativism, so should be environmental educators. We often proceed with openness and tolerance towards ideas, however, we must do more than clarify personal views and accept alternatives (see Kazepides, 1977). As Bloom points out, by simply accepting alternative values we are implicitly denying the importance of judging completing claims. In so doing, we limit possibilities for searching for understanding about what we and our society should do; we forfeit the task of pursuing what is "good" and "right".

There are environmental education programs which raise questions about values and help individuals clarify values and develop personal ethics. These are outstanding achievements and essential starting points. But, the challenge for environmental educators is to find ways to enable the discussions to go further.

One activity in such a program states: "conflicts arise...when a person motivated by one set of ethics tries to force his or her ethics on others through activities such as arguments, harassment, or legislative action (Project WILD, 1990, "Ethi-Reasoning"). I find this unsatisfying. We must acknowledge the importance of conflicts, and to help students understand their nature, to weigh the merits of contesting positions against their own values, and to modify personal opinions accordingly. I am also worried that such statements imply that citizens should not develop arguments for their positions, and that they shouldn't try to influence one another. While there are no absolute truths, we can certainly make judgments about what appears to be more good or more right in particular instances. And, surely one of the ways that we do this is through a kind of conversation which presents arguments that first challenge us, and then provoke responses. We must examine how this might be done.

Bloom's critics agree that anti-intellectualism is rampant and that the virtue of his tirade is to "remind us of what has been lost in the drive for rationalization, for the supremacy of science over philosophy" (Aronowitz & Giroux, 1991 p. 33). However, they also see a number of shortcomings in his work (see also Orr, 1992). Examination of their critical responses raises interesting questions which can have a bearing on our research. I will now examine three criticisms of Bloom in light of research needs in environmental education.

Choice of Texts

Bloom's critics agree that education should involve intelligent discussion about important ideas, however, there is doubt that his reliance on the "Great Books of Western Civilization" is adequate. As Orr points out, these classics are deficient: they were written by white males, they are culturally biased, and they fail to grapple with the intellectual challenges confronting humans and their role in their environments.

Orr has responded by producing "A Prerequisite to the Great Books of Allan Bloom: A syllabus for Ecological Literacy." He thus affirms Bloom's argument for studying substantive ideas. Discussion about environmental ethics, or any other ideas, cannot take place in a vacuum. Orr makes choice of content the issue. However, as interesting as his list is, we need to guard against replacing one rigid conception of "great books" by another.[2]

Orr's response raises other important questions. While we can argue that to be educated requires breadth of understanding, we still must grapple with the questions: What content will be most worthwhile? What ideas should be presented? Whose content should count? However, there are further criticisms of Bloom's work, and changing the texts, as Orr has done, is not sufficient to answer them.[3]

Gap Between Great Books and Vernacular Experience

It is possible to make a case for reading classic texts, either in traditional or revised form, because they continue to speak to today's condition (Aronowitz & Giroux, 1991). However, we must also take into account changes that have occurred in the terms of discourse. There is a vast gap between the classic texts and "vernacular speech and popular language which are deeply embedded in the collective imagination" (Aronowitz & Giroux, 1991 p.35). This does not mean that substantive texts should simply be replaced by shallow tracts as Bloom fears. We must, however, realize that there is tension between tradition and modernity or postmodernity and there is tension between intellectual communities and popular cultures. We must seek ways to ameliorate these tensions.

Ameliorating tensions will require us to know more about our students. They will be the ones who will evaluate claims and judge rightness. And, their evaluations and judgments will invariably be linked to personal experience, knowledge, and assumptions they hold. Challenging students to participate in philosophical discussions and ethical evaluations will require more than prescribing new texts. We will need to know who these students are, where they are coming from, what they find intellectually challenging, and what issues they find compelling. (Robertson, in press; Stevenson, 1993) Interpretive research seeks to enhance these understandings.

If viewed as an end, interpretive approach might rightly be criticized as relativistic (Stevenson, 1993). It seeks to inform rather than change practice. And, this is the conclusion that we are led to if we think of research as contesting, or alternative paradigms. However, if we regard research as responding to particular questions, and if we see the need to work with research traditions most suitable to these questions, then this need not be the case. The danger lies in expecting too much of the results, making false generalizations, or ignoring complimentary questions.

An additional challenge will be to find ways in which this and other research traditions can be mutually informing. How, for example, can interpretive and philosophical researchers compliment and enrich each other's work?

Gap Between The Academy and Teachers

It has been observed that "on the front lines, some teachers, buffeted and bewildered, continue to maintain fresh creative and critical approaches to their tasks. In doing so, they receive little or no sustenance from the intellectuals" (Aronowitz & Giroux, 1991 p. 34). There is frequently a vast gap between the language, attitude and experience of academics and the pedagogical realities of teaching. Resolution of this difficulty will require more than infusion of scholarly work into curricula. Like students, teachers will make decisions based on their personal experience, their knowledge, and the assumptions they hold. If the material they are given does not make sense to them, if it appears impractical, or if they judge it unsuitable for their students, they will not use it.

Clearly we need research which combines scholarly work and the work of pedagogy. This research will demand deliberate efforts to avoid the exclusivity of academics while fostering the willingness of teachers to engage in philosophical inquiry. And, it will require recognition of the practical realities. This will be a shared task where teachers and others participate together in exploring means to artfully combine teacher ownership of curricula and professional development with the intellectual challenges of our time.

Summary

I think that Orr, Bloom in his crusty way, and I agree that above all we need to be concerned with what we need to know to live humanely, peacefully, and responsibly on earth. And, we must set research priorities accordingly.

We will also need to revisit questions like: What will students and teachers need to know? What ideas can best stimulate their thoughts and challenge their intellect? And, how can we assist them to explore these questions enthusiastically. These questions are different and will require different, but complimentary, research. We need to understand how traditions of philosophical, interpretive, and participatory inquiry can be mutually informing. Orr, Bloom and the critics, have helped by creating tension between differing visions for education which demand our introspection.

Endnotes

1. It is interesting to note that Thomas Kuhn, who wrote extensively about paradigms (1970), and did much to popularize use of the term "paradigm", raised serious doubts about the usefulness of this concept to describe work in the social sciences.

2. It is also interesting to speculate about how much of Bloom's content would, in fact, be prerequisite to Orr's list. For example, some understanding of Homer's Odyssey is required to gain the full impact of Leopold's "Land Ethic" essay.

3. In response to Bloom's rather "bookish" approach to education, Orr also argues for first hand, practical, and experiential learning. This is an important point which deserves extensive discussion at another time.

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Urban Teachers' Perspectives of Environmental Education

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Introduction

This paper is submitted as an entry in the continuing dialogue concerning alternative paradigms of research. Rather than focusing on the strengths or weaknesses of any particular paradigm, the purpose here is to describe a line of research and its evolution.

A major premise of the investigations has been that positive youthful experiences in natural settings can lead to a lifelong interest in maintaining a quality environment (Tanner, 1980). For many youth, especially urban youth, exposure to these natural settings comes primarily through participation in environmental education programs at their schools. But the degree to which environmental education is implemented varies from school to school and classroom to classroom. Ultimately, whether students have the opportunity to experience natural environments depends upon the participation of the classroom teacher (Simmons, 1988). The question becomes, what are the factors related to whether teachers consider it their responsibility to incorporate nature study into the school curriculum?

The Initial Inquiry

It was with this general question in mind that the line of research began in cooperation with the U.S. Forest Service North Central Forest Experiment Station in Chicago, Illinois. The cooperative arrangement has, to this point, evolved into four studies. The initial investigation, begun in 1990, explored factors relating to the development of a sense of responsibility in classroom teachers for providing environmental education as a regular part of their program.

Focusing on teachers' familiarity with the natural environment, personal comfort levels with the natural environment, and their perception of the natural environment as a learning and recreation setting as well as the teacher's perception of the barriers to the use of natural settings (e.g. discipline, time, cost, training), a questionnaire was developed and mailed to approximately 800 randomly selected teachers in the Chicago metropolitan area. In addition, the questionnaire attempt to elicit descriptions of which types of natural environments are being used as learning settings (e.g. school site, neighborhood parks, forest preserves), while exploring the degree to which different types of sites are being utilized.

The results of the survey (see Simmons and Young, 1991; Young and Simmons, 1992) suggested that although teachers believe that providing nature experiences is important, relevant to the school curriculum, and something their students would enjoy, the teachers question whether they have the necessary skills and knowledge to teach environmental education. Additionally, they identified three major logistical barriers to providing nature experiences: 1) funding/cost; 2) concern over safety and; 3) time constraints.

Teachers' reports concerning providing nature experiences for their students and the types of settings they report using (e.g. school site, museum, zoo, nature center, forest preserve) are consistent with these concerns and barriers. For the most part, teachers report that they utilize the classroom, museums, and zoos to teach about nature and the environment. To a far lesser extent, however, they employ places such as the school yard, nature centers, forest preserves, and nearby city parks.

This was particularly intriguing given teachers' responses to questions regarding the desired availability of various resources if they were to take their students on a field trip to a natural area (Simmons, 1993). Understandably, especially considering their expressed concern over preparation, the teachers voiced a strong desire for staff help in teaching the students and the availability of additional information (e.g. brochures, exhibits). However, they also expressed a strong desire to take their students to a nature setting where there were unpaved trails, where they could get out and walk in the woods, and where they could experience a sense of solitude or being out in the wild. Less desired resources included a place with well kept lawns and grounds, dining hall, modern conveniences, picnic shelters, and playground equipment.

Extending the Questions

There seemed to be a discrepancy between what the teachers said they are doing with their students (e.g. taking them to zoos and museums) and the type of experience they desire for their students (e.g. a place where we can get out and walk in the woods). The questions raised by the initial study lead directly to a second and third phase. These investigations explored the factors that seem to relate to preferred teaching settings, focusing on the attributes of desired learning environments, perceived worth of various settings for environmental education, and perceived needs and barriers related to the use of settings (e.g. training, staff support, logistical support).

To examine the factors that seem to relate to preference for types of environmental education settings a two pronged study plan was proposed: 1) teachers were to be interviewed and; 2) a questionnaire was to be developed and distributed to teachers.

Teacher Interviews

Personal interviews were conducted with teachers from the Chicago metropolitan area, who teach primarily urban minority children. An effort was made to include teachers with widely differing experiences with providing environmental educational in natural settings. Black and white photographs which varied according to attributes (e.g. tree cover, lawns, trails, facilities) were used to elicit responses to interview questions. A total of 39 kindergarten through eighth grade teachers were interviewed for approximately 45 minutes each. Although very time consuming, conducting open-ended interviews allowed a more comprehensive examination of the topic, providing the opportunity for follow up questions.

The results of the interviews suggest (Simmons, in press) that teachers perceive distinct differences in nature settings. Their discussions of likes and dislikes provide insight into what attributes of these sites are most preferred. It is also clear that scenes do communicate educational affordances. Specific settings are seen as providing specific resources, eliciting distinct sets of activities. The results also suggest that the scenes elicit set responses based on past experiences or expectations associated with settings. Finally, settings elicited different sets of perceived resource needs.

The Questionnaire

Utilizing the results and questions raised from the interview, a photo-questionnaire was developed, tested and presented to teachers in the Chicago metropolitan area. The photo-questionnaire included a selected set of the most meaningful photographs from the interview phase as well as verbal items. The photo-questionnaire (data analysis is currently in progress) will be used to confirm and extend the investigation.

Exploring Children's Perceptions

If teachers perceive natural settings variously and act on those perceptions, it is only reasonable to assume that children will also hold distinct perceptions concerning the natural environment. Consequently, utilizing the results of the previous studies to inform the development of teacher training and other materials only addresses one aspect of the issue. Teachers and teacher trainers must begin to understand how students perceive the environment, what their comfort levels are, and what affordances they associate with varying settings.

Utilizing the same set of photographs as shown to the teachers, urban children's perceptions of various natural settings were examined. The focus of the study was on students' preferences, perceived comfort levels, and familiarity with the natural environment (data analysis is currently in progress).

Elementary school students from the Chicago metropolitan area were asked to rate 30 photographs of natural settings in terms of preference, comfort level, and familiarity. In total, approximately 350 students were surveyed. In addition, 3-4 students from each of the surveyed classrooms (n = 59) were interviewed in depth, allowing a more comprehensive examination of their views and providing the opportunity for follow up questions. Every effort was made to recruit participation from classrooms with high proportions of minority students enrolled.

The ultimate goal of this phase of the research is to describe how urban children view natural settings, what seems to interest them most, how they differentiate environments, and what attributes affect their level of comfort. The answers to each of these questions will help us design lessons that address urban children's needs and concerns.

The Future

The research is evolving. Differing methodologies have been utilized (e.g. questionnaire, interview, photo-questionnaire) at each step in an attempt to answer a continuing flow of questions. Although all the data has not yet been analyzed from the last two phases of this adventure, it is expected that new avenues of inquiry will be revealed.

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Research About the Impact of the Courses--Eco-School, Eco-Family and Eco-Community

Dolores Téllez de Landa, Ciudadana A.C. del Municipio de Garza Carcias, N.L.

Through Environmental Education, highlights the complex of interactions between the human and the natural systems, and the decisions that individuals, institutions and governments must adopt to change and manage those interactions, and the cultural elements that give them form.

A thematic division was established in 1989 in the Budapest Congress for the Environmental Education:

(a) Physical Ecology,
(b) Socio-Economic Ecology,
(c) Socio-Cultural Ecology.

The courses mentioned in the title of the present summary have been given at Universidad de Monterrey for three years, and they are mainly about Socio-Cultural Ecology. It remarks the value systems, thoughts and attitudes that must rule or rationalize the way of using natural resources and the relationships of the Human Being with himself, others and nature.

Ecological Pedagogy that we defend, is therefore based in the rich and wide ecological anthropology, applying it, principally to the Eco-family and Eco-school.

The Eco-community prepares the citizens to participate and to form Ecological Boards of Citizen Participation, that as a Civil Society collaborate with the Committee of each County Head, applying environmental, socio-economic and political rationalization.

The courses are taken in a period of 30 hours, 3 hours per session and a methodology of 30 minutes of exposition from the teacher and 2½ hours or work in shops with the participants. A workbook is given to each one of the attendants. These courses are backed by a Diploma from Universidad de Monterrey and the Council of Public Education (SEP), and they are dedicated specially for teachers, parents and community leaders.

Up to the present we have given twelve courses in Monterrey, one in Reynosa, Tamps. and six in Mendoza, Argentina. Approximately 650 people have attended the mentioned courses, including parents, Ecological Chiefs and the Suburb Presidents of the Metropolitan Area of Monterrey. We have collaborated, too, with 100 Ecology Clubs in different schools and Service Centers with the group "Civil OXXO Award".

In the Physical Ecology area, Instituto Tecnológico de Monterrey gives seminars to schools, communities, medium and small businesses, simultaneously to our courses.

Also, I co-work in Environmental Education in Integral Development of the Family (DIF Municipal), in Ecological Campings, as well as in Garden Clubs, and with the Municipality Council of Ecology.

We have thought in monitoring a middle-low socio-cultural level suburb during two years and do an investigation in five values: authority, logic, work, human relationships and kind of society. Because it is not possible to evaluate the values in an abstract form, we do it in the conceptualization in daily life, as well as in the traditional structure and in the eco-system that we propose with the Environmental Education. We think to do that in pairs or couples in a family (it does not matter if they are not husband and wife), at school, students and teachers and the neighbors' community.

At this moment, we are working in the ante-project of investigation in which your advice and support are very important for us.

System of Values or Manifested Values considered in the Pedagogic Process

The five values that form the system that the pedagogue considers like the most accessible to observe in the valuation system are: authority, work, logic, human relationship and the project of society. Next chart shows that important instrument of work in pedagogic advice.

1) AUTHORITY

Traditional Valuation	**Emergent Valuation**
Authority based on power, knowledge not shared (secret).	Authority based on irradiation, influence, transparency of motives and accessibility to assist others.
Respect to the institutional hierarchy, devotion for established institutions, duty and obligation senses.	Permanent evaluation based on hierarchy of the abilities, importance of the institutional innovation, necessity of inner motivation and support to the familiar group.
Elitism and dogmatism, centralization of the power and force relationship.	Participation, open and critical sense, decentralization of the responsibilities, perfection in the abilities development.

2) WORK

Traditional Valuation	**Emergent Valuation**
Diplomas important, responsibility based on age, theoric acquisition, social rank.	Importance of the life experience, responsibility based on the ability to solve problems and motivate persons.
Lineal course, programmed trajectory according to status, competition, honors, success.	Multiple courses, multiple election of goals, objectives and aims, cooperation, personal gladness, personal and group success.
To enhance the value of contribution and personal effort, hard work, devotion to an organization, valuation of the "external signs of work".	To enhance the value of creation and collective merit, creative work at his own rhythm, commitment to an objective, valuation of the efficiency to reach the goals, objectives and aims.
Material security of the situation, necessity of hierarchy domination and discipline. "Specialized portion".	Liberty for the acceptance of a risk and for the diversity of functions, co-participation necessity and co-reflection. "Social and human responsibility role".

3) LOGIC

Traditional Valuation	**Emergent Valuation**
Logic of exclusion (maniqueismo), unidirectional, cause list and sequential.	Logic of association (ecosystemic), mutualist, global.
Sufficient reason principle, objectivity postulate, analytical method.	Shared subjectivity contribution, objective facts and lived experience, systemic method.
Pure knowledge.	Creative thought.
No questions about the purpose.	Critical about the purpose of science and technology.
Technical process acceptance, economic growth and potency, nature domination.	Technical progress acceptance in relation to social necessities. Balance and distribution. Share with nature.
Man is the center of the universe.	The human being is part of a whole that excels it.

4) HUMAN RELATIONSHIP

Traditional Valuation	**Emergent Valuation**
Sectarism, intransigent.	Tolerance.
Aggressiveness, cynicism, skeptic.	Open, ingenious, enthusiasm, usefulness.
Use the others for personal purposes. Give an image of strength, of hardness.	Respect for others, be sincere with himself.
Domination. Private interests.	Cooperation. Interests unite. Seek group morality.
Uniformity, homogeneity.	Pluralism.
Quantity.	Quality.

5) SOCIETY PROJECT

Traditional Valuation	**Emergent Valuation**
National potency, individual well-being. Economic growth. Unfair distribution of functions and benefits.	Social tradition. Personal growth, interpersonal and in groups. Fair balance and distribution of functions and benefits, according to people's abilities and qualities, for the community's benefit.
Patriotism, chauvinism, nationalism, imperialism.	Internationalism. Interdependency between nations and cultures. Religion and belief contributions.
Wild capitalism, bureaucracy, communism.	Live together, service spirit, ecology.

STRAND I: EDUCATING ABOUT ENVIRONMENTAL ISSUES AND POLICIES

Partnerships-Three Florida Projects

Kathy Shea Abrams, Robert Raze, Jr., with Da'Mu McBride, Kate Muldoon
Florida Education Centre
Tallahassee, FL

PARKnership

PARKnership has blazed a new trail for environmental education in Florida. A cooperative effort of the Office of Environmental Education, Florida Department of Education and the Division of Recreation and Parks, Florida Department of Environmental Protection, the PARKnership program gives K-12 students a unique opportunity to conduct on-site resource management projects that serve park needs. More than 800 students from seven elementary, middle, and high schools participated in the program's first year, 1992-93. . Projects ranged from creating a butterfly garden to restoring sand dunes to producing a park orientation video for young visitors.

According to Jupiter High School student Elana Suprun, her work efforts at MacArthur Beach State Park were "worth the experience. Sure, the project involved two to three hours on Sundays and the weather was hot, but it was a small price."

Staff of both agencies, with input from teachers and park personnel, developed overall goals, and guidelines for the program. Local school and state park representatives jointly developed a list of possible service projects based on the interests and capabilities of the students and the needs of the park. Projects were selected to meet both educational and service needs.

Park rangers visited the students with the park, its resources, and needs. Some of the student projects required the use of tools and equipment, so that an park personnel instructed students on safety procedures and first aid.

School, projects, and parks in PARKnership's first year included:

- Jupiter High School students creating a butterfly garden at MacArthur Beach State Park, in North Palm Beach
- King High School students restoring a natural habitat of pine flatwoods by cutting young hardwoods at Hillsborough River State Park, near Tampa
- Lecanto Middle School students clearing a new nature trail at Homosassa Springs State Wildlife Park, 75 miles north of Tampa
- Brownsville Middle School students restoring sand dunes and planting seedlings at Big Lagoon State Recreation Area in Pensacola
- Estero High School students removing exotic plants from Koreshan State Historic Site in Ft. Myers
- Wesson Elementary School students devising a learning game about plant and animal life for young visitors to Wakulla Springs State Park, near Tallahassee
- SAIL High School students beginning a new nature trail at Maclay State Gardens in Tallahassee

To coordinate the PARKnership pilot project, staff of both agencies jointly developed a standard "PARKner" agreement form and a streamlined reporting form for schools and parks. The PARKnership agreement form provides instructions and space to specify the responsibilities of each partner in the project. The reporting forms were developed to provide a status report of site visits, student participation and activities three times during the school year. The agencies agreed to cosponsor a summit meeting for all participants at the end of the school year.

The PARKnership Summit, held at Wekiwa Springs State Park for a day and a half in May 1993, saw students, teachers, park personnel, and agency representatives reviewing the initial year. Students and their teachers using slides, videotapes, or photographic displays, described learning experiences and service accomplishments. School and park participants were unanimous in their enthusiasm for PARKnership. On the Summit's second day, each group of "PARKners" began planning their 1993-94 service projects. Six of the seven schools in the pilot project renewed agreements, and the seventh school plans to participate again when transportation funding is assured.

Participation during the second year is limited to thirteen schools. Schools were selected to participate on the basis of proximity to a state park and capability to secure from $500 to $1,000 for the school year to cover the costs of supervising and transporting students to parks for work visits. Some schools have secured small funding grants or raised funds on their on their own. Agency staff have already begun seeking sources of funding that would allow more schools to participate, and more students to benefit from PARKnership. As Tanya Lopez, a King High School student, explained, "the work was actually an enjoyable learning experience...(and) next year, we hope to publicize the program and encourage more participation."

Sharing Success in Environmental Education

"Sharing Success in Environmental Education", an annual awards program, identifies and recognizes Florida's finest school-based and district-level environmental education programs. Commissioner of Education Betty Castor helped initiate the program during the 1991-92 school year.

The program has four purposes. First, it offers examples of effective programs implemented with community and business participation. Those examples illustrate essential "partnership" components of Florida's new school improvement and accountability initiative, Blueprint 2000.

Second, by highlighting how schools and districts have sustained their programs, often with external funding and in-kind contributions, "Sharing Success" both informs and encourages other schools to develop programs despite district budget cuts.

Third, "Sharing Success" identifies and communicates the common factors of successful programs. Most of the programs employ innovative or creative strategies, such as: peer teaching; and a focus on local environmental issues to reinforce conceptual learning. The most successful programs periodically assess academic learning outcomes, through tests, reports, presentations, videos, and portfolios. Many also evaluate student attitudes and behavioral changes.

Fourth, "Sharing Success" encourages existing programs to improve by offering examples of how other schools have developed award-winning programs. A directory of case studies describes how each program began, grew, and showed results.

The case studies, along with separate sections on assessment, resources, and a guide to using the directory, are available in Natural Selections, the 1993 directory. The 1992 directory was heralded by representatives of schools, agencies, businesses, and nonprofit organizations, including one who mentioned his staff thought it was so attractive that they "couldn't believe it was a government publication!"

The OEE developed and carries out the program with assistance from a broad-based Advisory Committee and a large Review Team, both composed of representatives from businesses, government agencies, and non-profit organizations. Teachers from the 1992 Sharing Success winning programs also participated as members of the Review Team. The Team reviewed and rated the nominations, and made site visits to the semifinalists. The Advisory Committee ranked the nominations that the Team had rated, participated in site visits and made final award recommendations. Members of both groups attended the award ceremony.

In April 1993, the Committee recommended for awards 29 programs, including 19 school-based and 10 district-level programs. Each one received a framed certificate and environmental education materials valued at $50. The Assistant Commissioner of Education presented the certificates in a special ceremony just prior to Earth Day 1993.

During conferences and workshops in 1993, teachers from the award-winning programs and OEE staff made joint presentations on program features. In 1994, joint presentations are planned at conferences and meetings to "share the success" more widely.

Minority Intern Project

The OEE sponsored a one-year minority intern pilot project to emphasize the importance of environmental education in the minority community. The OEE employed a sophomore student at Florida Agricultural and Mechanical University (FAMU) as a full-time intern during the summer of 1992, and part-time from September 1992 through May 1993. Solid waste education was the project's primary focus, because solving Florida's solid waste problems requires the participation not only of government but also of all community members. The project created opportunities for student-community interaction on issues that affect households, businesses, schools and neighborhoods. The intern learned about environmental careers as he interacted with individuals working in environmental education, forestry, and county recycling.

The project familiarized the intern with environmental issues and the environmental education programs the OEE carries out. The intern spent a day and a half each week making classroom presentations or coordinating field trips. He devoted another day each week working in the office and preparing lesson plans. Florida's 4Rs curriculum (Recover, Reduce, Reuse, Recycle) was the basis of educational instruction, and was supplemented with support materials, including videos.

The project brought teachers and minority students from a local elementary school with a large minority population together with community mentors. Third-grade students with their mentors visited local businesses, parks, and natural areas to view and discuss methods of solid waste disposal, waste reduction, and recycling. They also heard speakers from county government, nonprofit organizations, and FAMU discuss environmental issues in their community.

Because the project's many potential benefits were realized, funds are being sought for its continuance.

Intern's Summary by Da'mu McBride

> This internship project was an experience of a lifetime. It has taught me the importance of education and how important our youth are! Environmental issues have also been imprinted on one for life. Dealing with the environment has changed my lifestyle and working in the office (OEE) has opened my awareness of global respect.
>
> While interning with the Office of Environmental Education and Wesson Elementary School, I learned to be sincere and dedicated for a purpose and not just to the job itself. Dedication and love for my work was instilled also. I may not have always showed my dedication, but I really felt love for my work and the things and people I worked for. I learned about things that happen in an office and how office duties and matters are dealt with, but most of all I learned to be confident and speak well with others.

Total Quality Environmental Management (TQEM) for Schools, Environmental Organizations and Government Agencies

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Taking their lead from Our Common Future, the 1987 report of the United Nations' World Commission on Environmental and Development, a growing number of 1990's Fortune 500 companies have embraced "sustainable development" within their corporate mission. They have committed themselves, at least in their policy statements, to environmental protection as a cornerstone of their profit strategy. Borrowing from the "Total Quality Management" (TQM) movement, many have adopted "total quality environmental management" as their operational means to upgrade product quality and environmental quality with an eye to long term as well as short term profitability. In the process these corporations may become institutional models for responsible environmental citizenship worthy of emulation in the educational, governmental, and nonprofit sectors of society.

What a potential turn around from the late 1960's-early 1970's origins of the environmental movement when corporate America was cast as the villain primarily responsible for environmental degradation! Indeed, business defensiveness on environmental matters and resistance against environmental legislation added credence to industry's "dirty dozen" image. Unfortunately, vilifying industry oversimplified the causes of environmental problems and drew attention away from the environmental impacts other institutions cause, a way of thinking that still exists in many quarters today.

The 1980's served as a transitional decade in defining the terms of the environmental debate on the national level. A decade that began with the promise of Ronald Reagan and James Watt to roll back the environmental gains of the 1970's closed with the election of George Bush and his promise to be the "environmental President." In between, threats exacerbated by world wide economic activity such as global warming, ozone depletion, deforestation, toxic wastes, desertification, and acid precipitation, not to mention human population growth, mobilized the international community. Sustainable development proved to have a universal appeal that brought former enemies together under one banner which lead, ultimately, to the Earth Summit in Rio de Janeiro in June, 1992.

The almost immediate success of the Global Tomorrow Coalition (GTC), created in the mid-eighties to foster sustainable development as an environmental clearinghouse for nongovernmental organizations, illustrates well the changing dynamics of the environmental movement. GTC succeeded in linking corporations, schools, universities, governments, environmental organizations, and civic groups in a series of "Globescope" assemblies held over several years in nearly every region of the country to develop grassroots environmental action plans at the local level. This cross-sector networking, implementing Rene Dubos' famous admonition to "Think Globally, Act Locally," nurtured corporate recognition that environmental protection is good business, thus laying the groundwork for increasingly conspicuous corporate environmental leadership in the 1990's.

Our Common Future's call for sustainable development was translated into a corporate blueprint, "Building the Sustainable Corporation," prepared for the 1992 pre-Rio "SYNERGY '92" conference, which linked diverse cosponsors such as The Corporate Conservation Council of the National Wildlife Federation, the International Chamber of Commerce, and the Business Council on Sustainable Development. The document contended that sustainable development can only succeed in a world that has achieved three interdependent types of security--ecological security, resource security, and socio-economic security--and called on industry world wide to work toward such global security. In a secure world, the report concluded, there will be significant long term market opportunities and competitive advantages for firms that commit to proactive, environmentally-sustainable economic performance.

Although 3-M (Minnesota Mining and Manufacturing) adopted its 3-P (Pollution Prevention Pays) policy in 1975, and companies responding to environmental consumer pressures such as Proctor & Gamble (disposable diapers), DuPont (plastics), and Dow Chemical (pesticides) acted earlier, widely endorsed corporate principles for environmental management did not appear until the early 1990's. In 1992 the International Chamber of Commerce (ICC) articulated sixteen "Principles for Environmental Management," chief among them being high priority commitments to environmentally sound management, to continuous improvement in environmental performance, to development of environmentally efficient and safe products and services, to use of environmentally sound technology, and to minimization of adverse environmental impacts in facilities operations and waste generation. Significantly, the ICC principles pledged companies to promote these principles among their contractors and suppliers, to monitor and regularly audit corporate environmental performance, and to openness and cooperation with employees, consumers, stockholders, and public policymakers in enhancing environmental awareness and protection.

In December 1990, President Bush created the President's Commission on Environmental Quality (PCEQ) which issued its report early in 1993. The PCEQ report outlines a "10 Initiative" action agenda to create voluntary private sector partnerships between environmentalists and business to achieve environmental solutions "more comprehensive, equitable, efficient and innovative than...mere compliance with governmental regulation." "Quality Environmental Management" (QEM), conceived as applying the sophisticated systems analysis and employee empowerment of Total Quality Management to prevent pollution, ranks first on the PCEQ initiative list. In summarizing the results of a dozen QEM corporate demonstration projects across the United States, PCEQ concluded that millions of pounds of pollutants were eliminated, companies saved substantial sums of money, production processes became more efficient and effective, quality of products and services was enhanced, employee morale improved, and both product and company image were enhanced. Key to QEM success, the report concludes, is the systematic use of "groups of employees with diverse skills" who are authorized to identify sources of pollution and potential remedial actions and to recommend steps to improve products at each phase of the production process.

TQM grew out of the need to jump start American economic competitiveness during the 1980's in the face of increasing international competition which forced layoffs of thousands of workers, including a large segment of middle management. To meet the international challenge and to satisfy the increasingly differentiated tastes of consumers, businesses simultaneously had to cut costs, improve quality, and customize products. With fewer middle management supervisors, companies had to empower workers to become more self-managing, efficient, and productive. According to Peter Senge, a leading 1990's management guru, successful companies would engage their employees in "generative learning" through systems thinking, shared vision, and team-building to unleash the productive potential of their work forces.

No other institution in our society has undertaken a comparable degree of self-assessment, whether for environmental protection, production efficiency, or other reasons. Perhaps other sectors of society should also scrutinize their environmental assumptions and practices. David Orr in his recent book, Ecological Literacy, targets colleges and universities for such self-analysis. His conclusions are not flattering. Arguing that "a genuine liberal arts education will equip a person to live well in a place," Orr charges that colleges prepare students only "to reside, not to dwell." In contrast with the "inhabitant" who becomes a harmonious participant in the interdependent ecological processes of his/her "habitat"--and thus masters the art of living ecologically--the typical resident student, with lodging, food, energy, and waste disposal provided by others, lives in an artificial environmental estranged from fundamental ecological processes during the highly formative late adolescent-early adult years.

Orr contends that colleges and universities have great leveraging potential, not only in their educational influence on students but in their ties to alumni and society's leaders, their importance to local and regional economies, and in their status as role models for society.

To realize this potential, however, they must make the campus an organic laboratory for teaching and learning. By studying the actual flow of resources--energy, food, water, materials, and wastes--through the campus, students can measure the campus' efficiency, environmental impacts, and viability as an ecological community within its regional location. One outcome might be setting campus resource policies which meet standards for sustainability. Another might be a reinvigoration of the curriculum around issues of human survival, an interdisciplinary focus with implications for virtually all disciplines.

Orr's critique of colleges has application to other institutions as well. All organizations, whether hospitals, military installations, government agencies, libraries, or retail stores, generate significant environmental impacts. And, given the largely peripheral role of environmental education in most people's formal educational background, creation of an ecological community in most organizations will have dramatic educational benefits as well as important environmental effects.

North Central College's experience represents a case study of how organizations might begin to become self-consciously ecologically responsible. An Earth Day conference in 1991, followed by a campus environmental planning workshop, sensitized a number of students, faculty, and staff who formed a paper recycling plan for academic buildings while students, joined by several faculty advisors, created an activist environmental club, "NCC Green." In addition to sponsoring annual Earth Day observances, NCC Green has developed a residence hall paper, can, glass, and plastic recycling program; worked with college administrators to promote use of paper and other products made from recycled waste; and requested more environmental studies offerings in the curriculum. The campus food service pitched in with cardboard recycling.

The advent of TQEM and sustainable development reflect the profound ways that the environmental movement has changed in recent years. The challenge for environmental education is to stay current. Although many business people and numerous corporations have yet to awaken to the new era, the day is long gone when environmentalists and environmental educators can build their message around a simple anti-business appeal. Of course words are only a beginning. Ultimately, the degree of an institution's commitment to environmental protection and sustainable development will be measured more in its deeds than its words, whether of corporations or other institutions.

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Governments and Environmental Groups in Partnership for Environmental Education

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So who needs partnerships?

We all do! When we think of "saving the Earth", we realize that no one person can do it alone. The same is true of environmental education.

Three years ago, the Canadian government started its *Environmental Citizenship* program. The goal was to encourage all Canadians to become environmental citizens-people who are informed about environmental issues and act on their knowledge.

Two federal agencies-Environment Canada and Parks Canada-were charged with making this idea work. The challenge was to "get into the hearts and minds of 27 million Canadians". But how? Clearly it required the government to reach beyond its internal capacities, to involve environmental educators of all descriptions. Adopting the idea of delivery through partnerships[1] was also consistent with the philosophy of environmental citizenship-that the task cannot be undertaken by any individual or organization alone, but that we must work together to achieve common goals. It gives recognition to the fact that there are many environmental educators already doing a wonderful job, and that it is important to complement rather than reinvent these efforts.

The program was thus designed for partners of all descriptions-businesses reaching their employees; community leaders and educators reaching out to their community; individuals involving their families and friends; environmental educators-both formal and non-formal-reaching their audiences; and environmental groups reaching out to their membership.

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[1] Note: The term "partnerships" is used throughout in its colloquial sense, in the sense of sharing in a project. Legally, the term implies more and the more accurate term would be "strategic alliance".

How much do you need to know?

Surveys told us that credible information was something educators felt they lacked.

So we created "Primers": set out in question and answer format and written for non-technical audiences. To date there are six primers[2] which provide basic reference material on a variety of subjects.

These primers are designed for use by environmental educators, both in formal and non-formal settings, and can be adapted to meet the needs of different audiences. But they are lengthy (100-200 pages), so for those searching for more digestible information, there are also "snapshots" on related issues. These are brief, readable and colorful overviews of the topics.

Will you be my partner?

The enthusiasm and variety of Environmental Citizenship partners has been heartwarming. To give just a flavor:

- The Canadian Electrical Association-representing all of Canada's electrical utilities-have signed an agreement with the Department of the Environment to promote environmental citizenship within their membership. This will happen as the utilities themselves become better environmental citizens and educate their employees accordingly, and as they educate their customers by mail and through education programs led by employees within their own communities
- The Girl Guides of Canada have developed a "Water for Tomorrow" program, offer a "water" badge to the Girl Guides, and have worked with the Water campaign to develop a publication called "Explore Water with Holly Heron"
- The Government of Alberta, as part of their focus on atmospheric issues, have printed copies of the Ozone and Global Warming Primers for distribution to school teachers. They are also preparing teachers guides to accompany these Primers

Environmental groups offer a special opportunity as partners. Many of them include environmental education as part of their mandate, and already have successful educational programs up and running with schools.[3] Their audiences are already somewhat aware and concerned-ready to take action and many prepared to act as community leaders. Surveys also suggest that for many people, environmental groups are a more credible source of information than the government.[4]

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[2] *A Primer on Environmental Citizenship; A Matter of Degrees; A Primer on Global Warming; A Primer on Ozone Depletion; A Primer on Fresh Water; A Primer on Waste Management; and The Nature of Canada: A Primer on Spaces and Species.*

[3] For example, World Wildlife Fund Canada's *Operation Lifeline* and Wildlife Habitat Canada/Canadian Wildlife Federation's *Project Wild.*

[4] Environics Research Group, 1992. *The Environmental Monitor: Omnibus Reports For Environment Canada 1991-3 & 1991-4.* Unpublished Report prepared for Environment Canada.

Can you spare a dime?

Traditionally, partnerships between governments and non-profit groups have been based on money, most often through grants and contributions.

Environmental Citizenship, for example, provided funds to the Canadian Nature Federation to produce a special issue of their newsletter "Nature Alert" on Spaces and Species. The funding allowed them to print a far larger quantity than usual. The newsletter was distributed in nature stores and the *Globe and Mail* newspaper in major cities across Canada.

However, not all partnerships need to be based on money. (In fact, with government funds increasingly limited, this is likely to be an increasing reality.) Another basis for a good relationship is simply mutual benefit.

The Canadian Wilderness Charter is a petition that asks Canadian governments to complete their systems of protected areas. As of 1992, national parks and national historic sites across the country placed copies of the Charter in visitor centres, and some used the opportunity to talk about the Charter and its goals in campground interpretation programs. World Wildlife Fund Canada, who is leading this campaign, has been very pleased. In 1992, more than 2700 signatures were collected in just six weeks, and the numbers promise to be much greater this year. Park interpreters were also very supportive, as it provided a focus to encourage a very simple action-a first step to environmental citizenship.

Multiplication across the nation

Another very important kind of environmental group are the environmental educators. (Of course!) They are *multipliers*-reaching large audiences of their own. Two partnerships between the EE community and Environmental Citizenship promise to be particularly exciting:

- At last year's meeting of the NAAEE-ECO-ED in Toronto-Canadian educators met to discuss the formation of a Canadian network of environmental educators. This idea was nurtured in subsequent meetings though the winter, and EECOM-the Canadian Network for Environmental Education and Communication-is about to come into being as a vehicle for communication among Canadian educators. This process was nurtured by financial and in-kind support from Canada/MAB (UNESCO) and Environmental Citizenship.

- An initiative of the Canadian Association of Adult Educators brought together a wide variety of professional education associations. This resulted in an informal "Coalition of Canadian Education Leaders" which has drawn up a declaration in support of environmental citizenship. To date, thirteen organizations have signed that they will *"call upon their own constituencies, governments and the community at large to commit themselves to certain principles of environmental citizenship and to offer educational programs to improve awareness, knowledge, attitudes, skills and practices related to sustainable development and the protection of our environment."*[5]

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[5] *Education to Promote Environmental Citizenship.* A joint declaration of Canada's educational leaders. 1993.

The Secrets of Success

Don't you wish it were that simple?

The pitfalls of partnering are many and varied-I'll save those for another day. But the elements that make for a successful partnership between the federal government and environmental groups in delivering EE are no different from those governing other partnerships: mutual understanding, clear goals, well defined benefits, and mutual trust and respect. Simply, the most successful partnerships are obviously those which create a "win-win" situation for all partners.

The goals of the two partnering organizations need not be identical, but they must be compatible. In producing Nature Alert, the Canadian Nature Federation's goals were to educate the public and to increase their membership. Parks Canada's goals were to educate the public and raise awareness of the Environmental Citizenship Program. Not identical, but certainly compatible.

Mutual understanding is part of this. Before entering a partnership it is wise to know as much as possible about the potential partner-their mandate and structure, their existing educational programs and their messages, the reputation of the organization and the individuals with whom you are dealing. And be sure they are doing the same for you! This way the project can be designed to best fit the needs of both.

Be clear about the roles you each have to play. Who is responsible for what? What are the deadlines and are they flexible? Who has editorial control over the final product or program? If money is to exchange hands, how much, after what stages and who decides that the job has been satisfactorily completed?

Last, and by no means least, mutual respect and trust are fundamental. If these are lacking, it raises serious doubts as to the value of the partnership, and whether it can be successful.

Conclusion

There are many benefits to be gained by creating partnerships for the delivery of environmental education: often projects that could not be achieved by one party alone become possible. The message for environmental educators is the same as for those who seek to better our environment: We cannot do it alone-it takes effort from all of us.

For information or publications on Environmental Citizenship write to:

Environment Canada,
Ottawa, Ontario,
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Generating Environmentally Responsible Behavior Through Recycling Education Action Projects

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A school-community environmental education program has been developed in Berkeley schools emphasizing local solutions to particular environmental problems. The program includes projects, such as environmental restoration and recycling, to involve students directly in helping resolve local environmental issues. The first stage involves learning about the ecological processes that contribute to ecosystem functioning. This is followed by active participation in projects addressing local environmental problems. It was hypothesized that by building a basis of positive first-hand experiences for these children it would be more likely that they would continue to actively help resolve other environmental issues.

Lunchroom waste reduction was a project taken on by several elementary schools. One class investigated the problem at their school, then conducted a national survey of school lunch waste and then presented their findings and recommendations to district officials. A second class designed and presented models of an ecologically designed lunchroom to school board members. Another school staged a lunchroom boycott and provided no-waste meals to participating students to emphasize their concern to the district.

Results of evaluations show that students' anxiety about the future due to environmental concerns decreased as they learned that they can make a difference through working for change. This was correlated with an increase in participants' feelings of self worth, an increase in their level of and an increase in their interest in related environmental issues.

Toward A Global Environmental And Societal Ethic--The Introduction Of Ecological Feminist Philosophies, Inclusive Values, And Spirituality Into The Classroom Through Environmental Studies Curricula

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Introduction

We have many individuals in our society that can perform a water quality analysis, but few who can perform a "quality of life" analysis and many environmental education programs, and possibly the environmental movement in general, lack a unified, cohesive set of goals, motivations, and ethics. The philosophies articulated in feminist theory, particularly the ideals of the ecological feminist and creation spirituality movements, may provide the foundation for a societal ethic that allows mutual respect and understanding for the planet and each other. An environmental studies curriculum, modeled after an ethic that is based on the interconnectedness and ultimate unity of all living things, would be an excellent vehicle for the introduction of these philosophies into the educational system and, ultimately, into society.

Some feminist philosophies that focus on the environment and the relationship between women and nature have highlighted the importance of the study of human domination throughout history. Many disturbing parallels exist between the domination of nature by humans and the domination of women by men. Ynestra King (1990) said that this joining of feminism and ecology into an ecological feminism, or ecofeminism, "calls for a dynamic, developmental theory of the person--male and female--who emerges out of nonhuman nature, where difference is neither magnified nor ignored and the dialectical relationship between human and nonhuman nature is understood" (p. 106). King goes on to say that:

> in ecofeminism, nature is the central category of analysis. An analysis of the interrelated domination's of nature-psyche and sexuality, human oppression, and nonhuman nature-and the historic position of women in relation to those forms of domination is the starting point of ecofeminist theory (p. 118).

Feminism has had an enormous impact on Western civilization, and ecofeminist principles serve to remind us that women have been at the forefront of every historical, political movement to reclaim the Earth. Women have often been the first to suffer and feel the effects of environmental degradation, usually being the first to fall victim to pollution of the land.

Historical Perspective and Justification

Global environmental awareness for the Western world may have reached a climax in the late 1960's when photos of the Earth hanging alone in space were returned from the Apollo 8 lunar mission. It is believed by many that this unique view of our "Spaceship Earth" did more to awaken people of this century to the need for self-examination than any other single event. It is a shocking realization that it has only been in the last 20 years that the West has begun to reawaken to the impact of our actions on each other, particularly women and people of color, and on our planet. Trying to build that new awareness into our system of politics, education, and society may be the prime challenge of the next century.

Science in general has been critiqued by the deep ecology and feminist movements, both calling for a reconstruction of science and the practices of scientific investigation and inquiry. Much research has been done to demonstrate that there are ways of knowing the details of our universe that do not require the objectification and domination that are the main theme of science today.[1] Since the industrial revolution, science has rejected spirituality and sheltered itself in a world of supposed "facts" and theories. Matthew Fox (1991) has said that "spirituality does not make us otherworldly; it renders us more fully alive." He claims that spirituality takes us "away from the superficial into the depths...away from the privatized and individualistic into the deeply communitarian" (p. 27). To be spiritual, he says, is to be alive, filled with breath, wind, and awe. A reintroduction of this form of spirit will enhance science and bring conscious back into scientific investigation.

The educational system, and environmental studies programs in particular, can use these philosophies to promote an understanding that organisms and planetary life-supporting processes are inexorably linked. A redefinition of classical notions of power will aid in the recognition of the interconnectedness and interdependence of all things on this Earth.

Educational Challenges

Future environmental education programs will better serve the student and the community if they become truly interdisciplinary and contain strong elements of social and cultural responsibility. Academicians often shy away from expressing a strong viewpoint to students for fear of emphasizing one "side" in a subject containing volatile, polarizing issues. Yet, without the expression of extreme views, it is often difficult to resolve an issue. These extremes contribute to the process of discussion and analysis and usually result in the discovery of the "middle ground," the balance point. Throughout a student's life they will be constantly faced with choices. To make these choices, they must possess the tools that enable them to discover the options and alternatives. Factual knowledge is often not enough since environmental issues are intertwined with legal, political, social, cultural, and personal aspects. Environmental programs with components that train the students in critical thinking, multicultural perspectives, social responsibility, morality, ethics, psychology, negotiation techniques, and other elements based on compassion will better prepare the student to aid in the resolution of complex environmental issues.

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[1] There is an ever-growing body of writing in the field of feminism and science, including the works of Sandra Harding (1991), Evelyn Fox Keller (1985) and Judy Wajcman (1991).

This approach to teaching environmental awareness as "planetary awareness" must also recognize that generations of today are unique in a very important way. Before the use of nuclear and biological weapons and before awareness of environmental degradation, all humans on this planet knew with certainty that, even in the worst of times, their children would walk the same Earth and breathe the same air (Macy, 1983). Today, however, we can actually see a possible future where our children inherit a horror. This new perspective has nightmarish effects on the human psyche that interferes with not only acceptance of this information, but with the intellectual power to do something about it as well. The anger, fear, guilt, and sorrow that results from this awareness must be acknowledged, processed, and directed if our full intellectual potential is to be available to develop solutions to the challenges ahead.

Students feel despair and hopelessness as they learn of the tremendous amount of environmental degradation taking place in the world today. When the parallel to the denigration of women is realized, an additional level of stress and despair, particularly among women and other historically disenfranchised students, is created. They are deeply affected but are ill-equipped emotionally to process these feelings. Emotions of fear, anger, guilt, and sorrow inevitably surface as one learns, for example, that over 2,000 people in the world have died of malnutrition during one's lunch hour. These emotions interfere with proper intellectual utilization of that information, yet they cannot be denied. Denial of these feelings has resulted in much emotional and physical stress. Modern science education does not address this critical reality in the learning process, resulting in deep-seated frustrations that the student may not deal with effectively. Insensitivities toward the issues may develop if these feelings are not acknowledged and processed, impairing judgment and the ability to think objectively. Modern psychological techniques in working with despair generated by the fear of impending global disaster could be effectively integrated into environmental science curricula. The author has successfully used these techniques in his environmental studies classes.

Education in the 1990's faces a challenge to acknowledge this phenomena and channel it into productive development for the world's teachers and learners, to provide a new dimension of understanding to the dynamic relationship that exists in the classroom between the instructor and the student. Many contemporary feminists, psychologists, philosophers, and environmental professionals have written on the awakening of an environmental ethic that has been long silent.

A new way of self-identification and appreciation is emerging during this stage of the evolution of the environmental movement in which people are realizing that we are part of a larger organism known as Earth. The ecofeminist and spiritual perspective must play a major role in educational values of the 1990's and its impact on thought, writing, research, science, and the humanities should be embraced and shared as a perspective that may reflect the ultimate global ethic.

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BATS Research!-Bat Action Through Student Research

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ThinkBATS is an educational program that invites students to become actively involved in generating awareness and concern for the protection of bats and their habitat. ***ThinkBATS*** includes four phases:

Phase 1. Research. Students research a particular bat species from a pre-selected list and become familiar with its natural history, habitat, feeding requirements, reproduction/care of young, and movement/migration patterns. Species this year include: the Little Brown bat, the Spotted Bat, the Pallid bat, and the Grey-headed Flying Fox. Teachers will receive written information on their species, the *Educator's Activity Book*, and *Bats: A Creative Book for Young Conservationists*.

Phase 2. Sharing. Students develop an education plan and share what they have learned with target audiences such as student, parent, and community groups. Participating students receive complimentary bat T-shirts to promote their plan. T-shirts are black with the four bat species on the front and back. They are 100% cotton. Teachers may also receive the *Endangered Wildlife Handbook* to help implement their program.

Phase 3. Marketing. Students market bat T-shirts through a presale for $10. Teachers receive all ordering information. All donations are tax-deductible and directly benefit bat education and conservation.

Phase 4. Habitat development (Optional). Students create a "bat friendly" area within their community. Teachers receive the *Bat House Builder's Handbook* to build a bat house and implement their bat house research project.

If you would like more information concerning ***ThinkBATS***, please contact Jane Jennings.

The Environmental Concepts about Teaching "The Earth Is a Complex Environmental System" in Elementary Schools of the Republic Of China (Taiwan)

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The industry and economics in the Republic of China (ROC) on Taiwan are more prosperous recently, but, in contrast, the living quality is getting worse day by day. In order to make ROC be one of the developed countries, how to improve environmental quality in Taiwan is urgent now.

To focus on the environmental education is the first important thing done to improve our environmental quality. The environmental education is the so-called process that people use education to teach people to protect living environment in order to keep environment concept, environment protection, and environment attitude toward our living environment. However, the action that people protect people's environment is invalid now.

By using Allman's concept schema (Allman et al., 1976) and concept coverage analysis method, Chang et al. (1991) find that elementary school students are learning a few environmental concepts from the elementary school curricula in the Republic of China on Taiwan. Also, Chen et al. (1991) describe that the environmental knowledge of the teachers was affected by their education background, and even the environmental attitude, the social value, and the environmental behavior of the teachers varied with the sex, age of teachers, and school locations. In the national policies, Chen (1991) suggests that the initial step for developing economical construction is to guard against pollution and public nuisance, to conserve natural resources for their eternal utility, to advocate the recycling and reusing materials, and save energy resources.

A draft of the framework of environmental concepts for the Republic of China on Taiwan was provided in 1990 by a group of scientists. The draft comprises an article of aim and six main concepts for the environment. The aim of the framework is to provide for a better understanding of people in Taiwan to recognize the importance of natural resources and environmental problems to keep an ecosystem balance and to maintain environment quality. The goal is to meet a sustainable use of natural resources that allows generations of people to follow a superior lifestyle (Chou et al., 1991). Focusing on the first main environmental concept of the framework,

> "The earth is a complex environmental system, which exhibits a series of complicated interactions involving living and non-living organisms, and how they are interrelated with each other,"

there is a need to study the "The earth is a complex environmental system" as a whole in the research of what environmental concepts are needed to be taught in elementary schools in ROC.

Purpose

The purpose of this study is to find what environmental concepts about "The earth is a complex environmental system" in the Draft of the Framework of Environmental Concepts for the Republic of China can be taught in elementary schools of the ROC on Taiwan.

Method/Instruments

The concept maps (Novak & Gowin, 1984) about the complex environmental system was fist designed depending on the contents of the outlines in the first main environmental concept of the A Draft of the Framework of Environmental Concepts for the Republic of China (Chou, et al., 1991) and Essential Learning in

Environmental Education (NAAEE, 1990) and other references (NWF, 1983; Tribe & Pritchard, 1984; Repetto, 1987). The concept maps were then carefully examined and revised by a group of environmental education specialists, and the concepts in the maps were also identified to have to be learnt by elementary school students. The main concept map about the first main environmental concept of the Framework and eight sub-main detailed concept maps in the main concept map are in Appendix I.

The items of a "Questionnaire of the Concepts about the Earth is a Complex Environmental System" used for what concepts should be taught and decided by elementary school teachers were written according to the final revised concept maps. There are eight main environmental concepts in the Questionnaire: (1) The Earth, (2) Biosphere, (3) Atmosphere and Community, (4) General Resource, (5) Mineral Resource, (6) Energy Resource, (7) Bio-Resource and (8) Environmental Change and Human Beings. A list of 103 positive statements were phrased and listed as items in the eight subtests. Wording of all of these statements was kept easily readable and understandable. No item involved compound sentences or concepts. A Likert Scale was devised for elementary school teachers responses. A panel of professors evaluated the items for construct validity and for clarity.

The items of the eight main concepts in Questionnaire were pilot tested with a group elementary school teachers, and reliabilities performed by SPSS program RELIABILITY in the eight main concepts are .93, .94, .91, .93, .97, .95, .93 and .82.

Sample

The refined questionnaire was sent to school teachers in 72 elementary schools around Taiwan area. The number of effective returned questionnaire having complete data and included in the study is 1081, the returned rate is 84.78%. There are approximately twice more as many females as males. Among the 1081 schools teachers, 22% are employed to teach science primarily and 78% are employed to oversee his/her class. Also, 97% of them are graduated from colleges or universities and 9 of them have M.D.

Analysis

Due to the difference between teaching science and overseeing class among the elementary school teachers, a comparison of the two group teachers was performed by using a multivariate analysis of variance using the items chosen results of the eight main environmental concepts. The result is presented in Table 1 and no significant difference was indicated between the two group teachers, Wilk's Approx. $F(8,710) = 1.02$, $p < .423$. Thus, there is no distinction from the items chosen results in the Questionnaire between teaching science teachers and overseeing class teachers.

Table 1

Multivariate Tests of the Effect of the Items Chosen Results of the Eight Main Concepts and the Effect of the Groups of Elementary School Teachers

Test Name	Value	Approx. F	Hypoth. df	Error df	p
Wilks	.989	1.02	8	710	.423

The SPSS program CROSSTABS is used to compare the grades, 1-6, on three group teachers: agree to teach, disagree to teach, and others.

Results

Because it could not add more environmental concepts in current national science curriculum and avoid to add more burden on children's science learning, it is decided to choose the most important environmental concepts needed to be taught in elementary schools according to school teachers choice on 70% or more in agreement to teach in the Questionnaire. Therefore, there are 55 environmental concepts suggested to be taught in elementary schools, and they are written down in a simplified form and listed in Appendix II. Many concepts in the Appendix are repeatedly suggested and listed in different grades.

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Successful Educational Tools to Change Behavior

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Helping people to understand the relationship between their actions and the quality of their environment has been the goal of the Groundwater Education in Michigan (GEM) Program since its inception in 1988. A cooperative effort between the Institute of Water Research at Michigan State University and the W.K. Kellogg Foundation in Battle Creek, Michigan, GEM has initiated local-level, action-oriented projects throughout the state of Michigan to educate citizens about the importance of protecting groundwater quality.

The Institute, Foundation and local groups each contribute unique skills to the program, which has evolved into a dynamic information network. The network benefits from the diverse expertise and facilities of the university and the programming skills and financial resources of the Foundation. The local projects, on the other hand, have the skills to identify what needs to be accomplished in their particular communities to protect groundwater. Regional groundwater centers at universities throughout the state offer technical assistance to these local groups as well as conduct their own projects.

To date, 38 innovative initiatives have been launched throughout the state. A traveling groundwater classroom, training programs for farmers and youth and adult leadership teams are some of the exciting activities that have resulted from this unique partnership.

Through ongoing evaluation of the GEM projects, surveys and in-depth interviews with the project leaders, a number of lessons have been identified as key to the successful implementation of groundwater education programs. These lessons can be drawn upon when planning community-level initiatives to help to ensure legitimate, experienced-based programs.

Five critical components of a groundwater education project have been identified: a focus at the local level; a dedication to leadership development and capacity building; an integrated focus on both education and policy change; an emphasis on enriching alliances and partnerships; and a program design that promotes long-term sustainability.

Local Level Programming

Experience within the GEM program has shown that activity at the local level represents the most significant and sustained cache of power to protect groundwater quality. Since groundwater by its very nature is a localized, site-specific resource, focusing the education efforts where the most knowledge of the local resource exists, and targeting individuals who best understand the local community, have been especially successful.

Passion and energy also runs deep at this level; however, if a project has an overly broad focus or seeks to teach general ideas of a non-specific nature, there is the danger of not capitalizing on this conviction of local citizens.

For example, a project initiated at the Huron River Watershed Council provides assistance to communities in implementing wellhead protection strategies. The Council works hand-in-hand with community leaders in order to meet site-specific, localized needs within the community, and this grassroots organizing has led to lasting change.

Capacity Building

As the GEM projects have matured, it has become evident that people, not technology, act as the catalyst for community change. The ownership for a sustainable community is more likely to come from those individuals who live within the community. A strong emphasis on individual and community capacity building will help to build this sense of ownership, and lead to strong, self-directed and motivated local leaders.

Without a doubt, educating individuals is easier than initiating action. Experience has shown, however, that when leadership development is emphasized in a project, action is more likely to occur both during the project time period and beyond.

This component was successfully incorporated into the project of the Crawford County Cooperative Extension Service. CES links groundwater education and leadership training in northern Michigan by forming youth and adult leadership teams. These teams choose methods for promoting groundwater protection in their communities, while CES helps them to develop the skills needed to make presentations, educate others and design exhibits.

Education and Policy

Education efforts are an imperative component of any groundwater protection activity. However, GEM projects have found that education does not automatically translate into a community committed to groundwater protection. While education helps to inform people about the need to protect the resource, real success comes when organizations and individuals are motivated to change their policies. Policy in this case is not meant solely in the public sense. Instead, activities should focus on changing institutional and personal attitudes and perceptions so that groundwater protection efforts become an integrated part of how people think and do business.

For example, the Soil Conservation Service (SCS) has developed a guidebook and video about agriculture's role in protecting groundwater which are now an integral component of SCS field staff training. In addition, the Cooperative Extension Service (CES) assists homeowners and small businesses with household hazardous waste issues. Through the use of a hotline, workshops and educational materials, CES helps people take the step from becoming aware of a problem to taking action to deal with it. At the same time, CES has used these project tools to strengthen other outreach efforts within the agency.

Enriching Alliances and Partnerships

Collaborative relationships between and among local, state, regional and national groups are vital to successful groundwater education projects. Cooperation and partnerships can increase the richness of the projects, as well as allow the project to tap into a wealth of talent and resources.

GEM projects have successfully worked with a variety of state and local organizations. Not only have these partnerships allowed the projects to increase awareness and recruitment for events, but they have also helped to avoid duplication of efforts and increased the likelihood of success by adding credibility from the multiple sponsorship.

Improving Michigan's Access to Geographic Information Networks (IMAGIN) is a project which actively promotes partnerships by bringing together universities, the state library, state agencies and local groups to form a data sharing network statewide. In addition, the Jackson County Intermediate School District has teamed up with the Ann Arbor Ecology Center to launch a hands-on groundwater festival for fifth graders.

For partnerships to be successful, however, projects have identified guidelines that should be considered. Partnerships require a long term commitment, with the roles of each player clearly defined from the beginning of the project. It is also important that the scope of the coalitions be limited, since overly diverse interests may lead to unnecessary conflict and never-ending meetings.

Sustainability

The design of a project and the marketing methods used to promote it will significantly impact its potential for sustainability. Again, it has been found that "general awareness" education activities are difficult to sustain. An educational program will more likely be sustainable if an underlying motivator is identified and the program is marketed in a way that addresses this need.

For this reason, GEM projects have found that activities with a groundwater theme are often difficult to sustain. Instead, a topic such as drinking water that directly and personally impacts an individual will more likely be sustainable in the long term. A groundwater pollution problem within one Michigan community prompted the Groundwater Center at the Delta Menominee District Health Department to use its expertise and resources to successfully address the problem. As a result, the county committed to continued funding after the initial grant had ended. The Muskegon Area Intermediate School District capitalizes on its location adjacent to Lake Michigan by combining groundwater and river water quality projects, thus helping to increase its marketability to future funding sources.

Conclusion

Groundwater education projects initiated within the GEM program have had tremendous impacts throughout Michigan. Although these projects target a variety of audiences with a number of different methods, several common lessons have emerged. The most successful projects focus on the community level; explicitly target leadership development and capacity building; focus on both education and policy; enrich alliances and partnerships; and are designed and marketed to be sustainable in the long term. These lessons learned can be applied to other community-based efforts in order to help projects successfully overcome barriers and capitalize on opportunities within the community.

Kids in Creeks-A Creek Exploration and Restoration Program

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Despite the passage of the Clean Water Act of 1972, water pollution continues to be a major threat to our nation's water bodies. While significant progress has been made in reducing pollutant loads from the San Francisco Bay and Delta's industrial dischargers and treatment plants, the amount of polluted stormwater to the Estuary has increased. According to the California State Water Resources Control Board, non-point source pollution is the major cause of water pollution in California. Because of the complexity of the issues, public education, leading to behavioral modification, is the most viable way to minimize this problem. And, education directed at teachers who can then become facilitators of knowledge to their students and their students' families, is not only efficient, but effective.

Developed in 1991 and piloted in 1992, *Kids in Creeks: A Creek Exploration and Restoration Program* is an innovative education program that addresses an environmental issue which is of high priority in the San Francisco Bay Area--water pollution. In order to make water pollution more relevant, teachers and students need to be involved in action-oriented projects, to see first-hand how they are connected to their watershed, and to understand the importance of water resources and their place in human and natural systems. All too often students are spectators and not active participants in the learning process. By actively engaging in learning about aquatic systems, students create meaning for themselves and develop an interest in and responsibility for improving and protecting water quality throughout California. By providing teachers and students with accurate and locally relevant information, the *Kids in Creeks* program empowers the future stewards of the Estuary with an enlightened environmental ethic and the confidence and skills to actively participate in decisions affecting the protection and use of natural resources.

Kids in Creeks is a student-driven action-oriented program that assists teachers and their students with studying watersheds, participating in hands-on science and investigating local environmental issues. The goals of the program are to teach educators and students to respect water resources, change the everyday practices that adversely impact these resources and to teach them about watersheds so they can be better managed in the future. *Kids in Creeks* has been designed to:

- engage students in real science
- make students aware of the natural world near their homes and schools
- provide opportunities for students to feel pride in their neighborhoods
- furnish students with an awareness of the sources and impacts of water pollution
- develop values of concern and caring about environmental quality
- enhance problem-solving and critical thinking skills
- provoke thought about the effects our lifestyles have on the environment

Kids in Creeks is a two-tiered program that targets students in grades K-12. The first tier consists of easily performed activities that can be conducted either in the classroom or outside. The second tier provides teachers and students with assistance in developing and conducting community action projects concerning issues related to aquatic systems. Supported by program staff and a variety of local organizations, these projects encourage action and focus attention on environmental issues that affect the local community.

The *Kids in Creeks* training workshops provide educators with background information on creek ecology, urban runoff pollution, aquatic insects, hydrology, and botany. These workshops, free of charge to Alameda County educators, are two and a half days long. The first day and a half is spent at a creek site in a relatively natural setting in order to give teachers the opportunity to familiarize themselves with natural systems. The last day of the workshop is held at a school site, so that teachers can be exposed to the challenges facing them while teaching about urban creeks. Some of these challenges include difficulties such as access, barbed wire, cement channels, blackberry and poison oak, and debris in the creek. At the school location, teachers find out how they can implement what they have learned during the workshop. During the workshop participants receive a packet of materials containing activities that can be easily performed with students, and instructions on how to conduct action projects, such as cleaning up a stream or stenciling storm drains, with a class. In addition, teachers also receive materials that include a watershed map showing their school's position within its watershed, a county stream improvement map highlighting the creeks near their school, and historical and current articles about local creeks. Activity and reference guides such as, *WOW! The Wonders of Wetlands*, *Dipping into Creeks*, and *An Introduction to the Ecology of San Francisco Estuary*, are also provided. Graduate level credit is offered for the class.

Each teacher that has participated in the program has conducted an action project with their classes or taught them creek ecology and urban runoff. Through these projects, *Kids in Creeks* has raised student and public awareness and focused attention on local environmental issues. Visible results have been seen in the action projects that classes selected. Storm drains have been stenciled, creeks cleaned up and "adopted," class reports written, and creek-based coalitions between schools and communities have built. Examples are as follows:

> My long term goal for the fall of 1993 is to "adopt a creek". Once the students become involved with a creek of their own they will take pride in this creek and will feel a sense of ownership and environmental accomplishment.
>
> *Susan Jacoli, Otis Elementary School, Alameda*

John Muir said, "When we try to pick out anything by itself, we find it hitched to everything else in the Universe." By improving a neglected corner of our school grounds, our students will realize the global effect small actions can have. It's a pleasure to feel a small part of that.

Kathleen Giustino, John Muir Elementary School, Berkeley

I plan to lead my students in an anti-pollution campaign. By teaching students about urban runoff, soil erosion, storm drain pollution and land management, I will be able to participate in this campaign at a tangible level by marking storm drains and spreading information door to door. I hope to coordinate a creek clean-up in my area, and to enlist the help of high-school field biology students to act as tutors with small groups of primary students in the field.

Patricia M. Baker, Portola Elementary, Livermore

Our mural shows a clean, healthy creek centrally but one section will illustrate a community of homes and stores, another a farming region and the urban runoff pollution from those sources. Carla Schultheiss, from the Alameda County Clean Water Urban Runoff Program came to our school on November 18 and in three hours, she and eighteen students stenciled about 30 storm drains in our immediate school neighborhood.

Donna Crum, Marshall School, Castro Valley

Our students feel very strongly about protecting our creek and want to have a positive impact on it...[a] group of interested teachers at my school have begun discussing the organization of a Saturday community clean-up project. Several of us have students who have been asking about cleaning the creek for several months now. We feel that as interest is high among the students, they could effectively generate interest among their parents...AHI staff have offered follow-up advice to effectively implement an action plan which may include such things as neighborhood pamphletting, student made signs placed in store windows, notification of local newspapers and magazines, letters to appropriate agencies.

Denise Rama, Hawthorne School, Oakland

By working directly on tangible and locally relevant issues, students are learning to identify positively with their watershed and develop attitudes of respect and caring for its integrity. In addition, communities have benefitted as residents become aware of these projects and the reasons that they are being conducted. Creek studies will continue to benefit the Bay Area's impaired water bodies by introducing teachers, students and communities to their aquatic resources and teaching them about how their actions affect these resources. Building creek-based coalitions between schools and their communities, *Kids in Creeks* will not only have a beneficial impact on water quality in the San Francisco Bay Area, but will benefit impaired water bodies throughout California by educating communities, as well as students, about urban water pollution issues and how everyday behavior that impacts aquatic resources can be changed.

The Africanized Honey Bee (AHB)

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Most likely, honey bees diversified from a common wasp-like ancestor, as a relationship developed between bees and angiosperm plants 60 to 100 million years ago. Climate has had a powerful effect on the evolution of honey bees and the diverse types of honey bees can be conveniently divided into two broad groups: temperate-evolved (European) and tropical-evolved (African) races. Honey bees are not native to the Americas and the first colonies were brought with the European settlers during the 1600's. For hundreds of years, beekeepers have worked with the European races to produce the honey bees of today which are big honey producers, are gentle, and are easily handled. That is, they don't swarm and they won't abscond (or abandon the nest without dividing the colony and rearing a new queen).

In 1956, a Brazilian entomologist imported a tropical strain or race of bees from the southern part of Africa to develop bees better adapted to the tropical conditions of South America. During these early studies, a group of queens and drones escaped from an apiary near Rio Claro, Sao Paulo, Brazil. Their vigorous proliferation demonstrated their superiority to temperate-zone bees in a tropical environment. The northward migration of these bees moved at an average speed of 200-300 miles per year. Africanized honey bees (AHBs) entered the United States in Hildago, Texas in October 1990.

Through normal migration, Africanized honey bees are expected to reach California in the late Spring or Fall of 1994. Government officials and knowledgeable scientists recognize the perception is definitely worse than reality.

Unfortunately attention on Africanized honey bees has been focused through shock stories and jokes, bad puns, and lurid tales of death by stinging. Nicknamed the "Killer Bees," they are the media star of tabloids, B movies, sensational reporting and television comedy. Consequently, the public's impression of the Africanized honey bee goes far beyond its natural significance, and even beyond the normal fear many people hold of stinging insects. Fear influences behavior and people want to avoid bee stings! The behavior of a fearful person may be irrational, such as crashing a moving vehicle while trying to "shoo" a stinging insect.

Facts must be separated from fiction regarding AHBs. Africanized honey bees are nearly identical in appearance to European honey bees, known as domestic honey bees. Since we are most familiar with domestic honey bees, we must recognize that the behavior of Africanized honey bees differs significantly, especially around the hive.

Without the knowledge of how AHBs differ from the honey bees we know, false perceptions will promote fear and irrational behavior. Some people hold the perception that Africanized honey bees are big, black, hairy and carry a lethal sting. Others believe that AHBs attack in huge numbers and that such attacks are common in areas where the bees have become established. A common misconception is that Africanized honey bees lay in wait for unfortunate victims and attack unprovoked. Or, that AHBs are a marauding band of crazed insects looking for victims to prey upon and exhibit their wrath.

In reality, although AHBs do show some behavioral differences from European honey bees, they are similar in many respects. Both pollinate flowers, produce honey and wax, have the same toxicity of venom and can only sting once. They look so alike that scientists must use special measurements, microscopic examination and computer programs to tell the specific differences between AHBs and EHBs. Because of the genetic swamping of European bees with Africanized traits, DNA studies are increasingly more critical in proper identification.

For lay people, the honey bees' behavior is the key to identification. Although Africanized honey bees are less predictable and more overtly defensive than domestic honey bees, they react only when their nest is threatened. While AHBs tend to defend their colonies more vigorously and sting in greater numbers, with less provocation, it must be remembered that their venom is no more poisonous than domestic honey bees. When disturbed, Africanized honey bees will pursue an enemy one fourth mile or more and take longer to settle down, often up to one-half hour, occasionally longer.

In order to monitor and slow the northward spread of Africanized honey bees, the Animal, Plant and Health Inspection Service (APHIS) of the United States Department of Agriculture (USDA), in cooperation with the Mexican government, established a program in 1987 of swarm trapping, queen marking and replacement, increased drone rearing and public education. A similar effort was launched in the Rio Grande Valley of Texas in the summer of 1990. Since that time, APHIS, ARS (the Agricultural Research Service) and Texas A&M have established traplines in Texas to observe changes in the resident population of honey bees as they spread.

Now that Africanized honey bees have migrated to Arizona, the federal government has decreased its involvement. Although the Technical Working group of USDA (composed of five agencies) is still functioning, funding has been reduced. ARS still maintains the Bee Research Laboratory in Beltsville, Maryland where focus is being placed on identification procedures and development of AHB repellents. All active trapping by USDA and ARS has been discontinued in the field. A National AHB Coordinator for USDA has been appointed, but will serve in an advisory capacity only after 1993. Trap lines and other related activities must now be maintained by state agencies.

Because of the AHB threat to public health and agriculture, the joint San Diego-Imperial Counties Africanized Honey Bee Task Force was formed in December 1989. Serving as a model for the state with representatives from over thirty-eight groups, the Task Force formed six subcommittees with the following goals:

Beekeeping Management-Create a plan to educate beekeepers on how to continue operating after AHBs arrive.

Education-Prepare a plan to disseminate information about AHB to groups involved with education. This includes school administrators and officials, school boards, teachers, and Parent Teacher Associations.

Public Health-Educate those health service providers who will assist sting victims. This includes physicians, nurses, emergency room personnel, and local health service agencies.

Public Information-Prepare a plan and materials to educate the general public about AHB. Also focus on how to enlist the media to disseminate accurate, calm information about AHB.

Training-Plan a training and education program for "first and second response providers," those people who may be contacted and asked to assist at the scene of a stinging incident. Training is intended for emergency service providers such as police, fire fighters, EMTs and other rescue personnel.

Quarantine and Regulatory Procedures-Concentrate on protective measures that can be created through legislative, regulatory, and quarantine procedures.

The Governor of California has appointed a State AHB Task Force to develop comprehensive plans of coping with AHBs. State-wide subcommittees of funding, bee control and prevention, public information, regulatory, and research are active. To facilitate the cooperative leadership in preparing for and dealing with Africanized honey bees in California, a Memorandum of Understanding was developed with the California Department of Food and Agriculture, the California Department of Health Services, the California Agricultural Commissioners and Sealers Association, and the University of California, Department of Agriculture and Natural Resources.

It is expected that Africanized honey bees will reach San Diego and Imperial Counties before other areas of California. Once the local AHB Task Force completed its mission, a Memorandum of Understanding on AHBs between San Diego County Department of Agriculture (DAWM), Department of Health Services (DHS) and Farm and Home Advisor of University of California, Cooperative Extension (F&HA) was signed. Each signatory agreed to specific areas of responsibility. DAWM will regulate the apiary industry, assist with AHB detection trapping, monitoring, analysis and identification, and coordinate training for emergency response agencies. DHS will control vectors and serve as a liaison with the medical community. Lastly, F&HA will conduct educational and outreach activities concerning AHBs.

F&HA received funding to hire a full time curriculum writer to prepare lessons about Africanized honey bees. A complete curriculum was developed, K-12th grade, and is expected to be ready for implementation following extensive field testing, early next year. This curriculum will be made available throughout the United States.

Africanized honey bees are here to stay. The extent and nature of their impact will depend largely on our response. We must preserve domestic honey bees to grow food and to produce honey and other hive products upon which we depend. It is an ineffective strategy to eradicate all bees in the attempt to kill Africanized honey bees. Our best solution is to learn to live with them. We can protect ourselves from Africanized honey bees by being knowledgeable about their behavior, avoiding beehives, supporting beekeeping efforts, and by taking a few precautions. Because of such broad ramifications involved in the arrival of AHBs to an area, using a cooperative strategy to prepare the public for them is the most successful and cost effective approach.

The Urban High School Environmental Journalist Program

Catherine MacFarlane
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Overview

In January, 1993, the Communication Department at the University of Michigan began working as a partner with the National Consortium for Environmental Education and Training (NCEET) to assist urban high school journalists in reporting on environmental issues. The primary goal of the program is to help high school students become increasingly aware--through print and broadcast journalism--of environmental problems that most directly affect them and the courses of action available to them to act on these challenges.

High school newspapers, magazines, and videos are powerful mediums of communication for high school students. Because these mediums of communication are written and created by students for students, they are often more credible than those written and created by teachers or other adults. For example, a student-written article or a student-produced video about school recycling efforts is more likely to stimulate other students to recycle than is a directive from teachers or from the principal.

Since the program's inception, three partner schools and one school district have initiated reporting on environmental issues through Journalism, English, and Science classes. These partners are the High School for the Communication Professions in Cincinnati, the High School for Environmental Studies in New York City, Southwestern High School in Detroit, and the District of Columbia School District. In March, 1993, representatives from the partner schools met in Ann Arbor to brainstorm ideas about the direction of the NCEET's Urban High School Environmental Journalism Program. Based on the ideas from that meeting, the following is a brief description of each of the partner's activities to date and plans for the upcoming year.

The High School for the Communication Professions

Cincinnati-area high school students who are interested in print and broadcast journalism make up the student body at the High School for the Communication Professions, a magnet school in downtown Cincinnati. The school is equipped with television and radio studios, video equipment, desk-top publishing capability, and teachers who are able to incorporate the teaching of journalism through the teaching of math, science, English, and social studies.

One subject area that was not being covered to the satisfaction of Jene Galvin, the Dean of the school, was environmental issues. Through the school's partnership with NCEET, funds were made available to provide a mentor for the students (and a model for the teachers,) a local TV journalist whose help was enlisted through the Society of Environmental Journalists. The reporter spent several class periods with a group of students, helped them decide which two environmental topics they should cover, and coached them on interviewing, video-taping, and editing techniques. Upon completion of the video-taping and the editing, the two news stories were aired on a local cable TV station and broadcast to all schools in the Cincinnati area.

Future plans with the Cincinnati school include continuing the mentoring project with the TV reporter and enlisting the help of a print journalist who has a special interest in environmental issues to provide the same type of assistance in print journalism.

The High School for Environmental Studies

Unlike the Cincinnati school, the High School for Environmental Studies, a new magnet school located in Manhattan, needed no assistance with environmental subject matter--every class at the school is taught using local, regional and global environmental issues as the focus. One of the teachers, however, wanted to establish a journalism program at the school and since no other teachers had experience running a school journalism program, the teacher, Stephanie Rose, turned to NCEET for guidance.

At one time, Ms. Rose had been a photo-journalist with a special interest in environmental subject matter. In her new job as a teacher, she wanted to pass on her enthusiasm for environmental issues and environmental journalism to her students. What was lacking was equipment to create a newsletter--computers, desk-top publishing software, and manuals on establishing and running a high school journalism program. Through the NCEET grant, Ms. Rose and her students published the first two editions of *Ailanthus*, an 8-page newsletter with reviews of environmental books, articles on field trips, environmental internship experiences, and poetry--all written and created by the students.

In the school's first year, 92-93, the only students at the school were ninth graders; in this school year, 93-94, the school has grown to ninth and tenth graders. We hope to help Ms. Rose expand her journalism program to include the newer students and to provide her and the students with additional computer equipment and educational materials to use in their journalism endeavors.

Southwestern High School

Southwestern High School, located in a once heavily industrialized area of Detroit, sits within one mile of abandoned Ford factories, a BP Oil refinery, cement and salt storage facilities, sewage plants, and steel mills. Because of the declining economy, many neighborhoods surrounding the school have declined as well. The students at Southwestern are concerned about the way their neighborhoods look (and smell and sound)--this became apparent through an environmental survey that the students completed at the end of the 92-93 school year.[1] According to the survey, the students' number one environmental concern is cleaning up the litter in their neighborhoods in order to make the neighborhoods more livable.

In June, 1993, NCEET funds enabled journalism and science students to take a field trip to visit the sites described by students in the survey as both environmental problem areas and environmental success stories. Prior to the field trip, an environmental journalist from the *Detroit Free Press* came to talk to the students about the issues they need to be aware of when visiting environmental sites. On the trip, each student was given a camera and was instructed to take pictures at the different sites. After the pictures were developed, the students created photo displays and wrote short articles based on their experiences.

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[1] The survey, conceived of by Jene Galvin, Dean of the school in Cincinnati, covered topics such as the students' definitions of the word "environment" and the best and worst environmental sites in the neighborhood and at school. It was administered to 300+ students at Southwestern and will be administered in urban schools elsewhere this year.

In October, 1993, six graduate and undergraduate students from the University of Michigan will begin assisting the journalism class at Southwestern with the environmental journalism project. The college students will team-teach one journalism class per week, focusing on the issues brought up in the surveys completed last spring and on other environmental issues of particular importance to this group of journalism students.

District of Columbia School District

Through funding from the Freedom Forum, a journalism non-profit organization that focuses on issues of equity, race, and environmental issues, the *Washington Post* granted one of their journalists, Retha Hill, a leave of absence to help re-establish journalism programs in 17 of the schools in the District of Columbia. Like Stephanie Rose in New York, Ms. Hill has a particular interest in environmental issues. Based on that interest, she hoped to enlist the help of the journalism teachers in the various schools to incorporate environmental topics in their journalism classes.

In May, 1993, Ms. Hill organized and facilitated a journalism workshop for 30 students from the different targeted schools. The workshop included environmental speakers and sessions on environmental topics such as environmental equity and race issues. In the upcoming school year, Ms. Hill will be organizing a teacher training workshop for the journalism teachers from the participating schools that will include sessions on including environmental issues in the journalism classes. The NCEET project will fund this teacher training workshop and send the director of the project, Jonathan Friendly, to speak to the teachers about environmental journalism.

"The Environment at School"

After the students at Southwestern High School completed the environmental surveys, we discovered that the students were mostly concerned with problems that were very close to home. These problems included litter in the neighborhood and at school, overheated classrooms at school, and asbestos in the chemistry lab. Based on their concerns, we have created a guide for teachers of journalism entitled "The Environment at School." This guide gives an overview of five problems that potentially can be found in schools: garbage, asbestos, radon, lead in drinking water, and over- or under-heating in classrooms. The guide then describes how students can find out more about these issues--how *they* can be investigative journalists.

Additional Future Plans

Future plans for the four existing partners have been described previously in this paper. Beyond those plans, we will focus our attention on working with teachers by creating additional modules to assist them in incorporating environmental issues into their journalism classes. The subjects and design of the modules will be based on feedback from "The Environment at School" and based on suggestions from the partners. We also hope to recruit two more urban schools or school districts (perhaps from Chicago and Los Angeles) to be partners in the program.

For more information on this program, please contact Jonathan Friendly at (313) 763-5943.

The 4-H Oak Woodlands Wildlife Habitat Project--Helping Protect an Endangered Treasure

Michael Marzolla and Richard Ponzio
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California's oak woodlands are endangered. In the last 200 years, since the arrival of European settlers, oak woodlands have been cleared to provide space for farms, ranches, houses, freeways and cities.

Today, approximately 7.4 million acres of oak woodlands remain in California. These woodlands provide habitat for more kinds of wildlife than any other major vegetation type in California. Over half of the 600 vertebrates that occur in the state spend at least part of their lives in oak woodlands.

Californians value the oak woodlands not only as wildlife habitat. Oak trees are beautiful, and increase property value. They prevent soil erosion, help keep water clean and provide shade for wildlife. In short, oaks are a critical component of California's landscape, and Californians have become alarmed by their loss.

In 1986, in response to this concern, the University of California established the Integrated Hardwood Range Management Program (IHRMP), a special program of education and research aimed at managing, maintaining, and protecting California's oak woodland resources.

To help increase the awareness, understanding and appreciation among youth of the value of oak woodlands and their wildlife, IHRMP funded the development of a curriculum by the University of California 4-H Youth Development Program.

The result is the recently completed Oak Woodland Wildlife Habitat Project. The project includes a series of "hands-on" and "heads-on" activities designed to be led by older teens interacting with younger learners, solving problems, recording observations, making inferences, and so on. The project is also designed to lead youth to carry out positive activities on behalf of the oak woodlands and their wildlife, dovetailing the concepts that they learn in the project with community service projects that they design and carry out. These might be anything from woodland restoration to organizing to influence public policy. It should be noted that the project is designed to match the community service graduation requirements for California high school students.

The Oak Woodlands Wildlife Project is organized into six sessions, requiring six to eight hours to complete. The sessions are designed to help participants develop an awareness and appreciation of oak woodlands and to introduce them to the components of an oak woodland, and the complexity and diversity of organisms found there. The sessions go on further to introduce the oak woodlands as a habitat, and then help participants examine the factors that are endangering them. Activities guide participants to understand the variety of animals that depend on oaks for food and shelter, and they learn that wildlife populations fluctuate according to the availability of this food and shelter. The sessions go on to explore the concept of niche, and how animals live together in an oak woodland. Next, playing the acorn woodpecker simulation game, participants learn how the acorn woodpecker gathers and stores acorns and how they compete for acorns with squirrels. This is followed by an activity that helps participants explore the concept of animal adaption and the principals of concealment and camouflage. The materials conclude with the oak woodland game, helping participants to identify factors that positively and negatively impact an oak woodland. The game goes on to reinforce positive actions on behalf of oak woodlands. Accompanying the material is a 15 minute video, "Endangered Treasures: California's Oaklands." Produced by the UC 4-H Program in cooperation with ECOVISION, a private producer, the video introduces participants to the oak woodlands, their inhabitants, and the threats to their preservation.

The 4-H Oak Woodland Wildlife Habitat Project is being distributed as part of our 4-H SERIES program (Science Experiences and Resources for Informal Educational Settings). SERIES is a national program, developed and distributed by the University of California 4-H Youth Program with a grant from the National

Science Foundation. You may be aware that the 4-H program is the largest youth program in the United States, with nearly six million participants. 4-H is a nonformal educational program of the National Land Grant University System. The 4-H program also shares its resources and expertise with other youth organizations, such as scouts, youth clubs, and "Y" programs throughout the United States, and internationally through its affiliates. For further information on this project contact Michael Marzolla at (805) 568-3330 or write UC Cooperative Extension 4-H, Santa Barbara County, 105 E. Anapamu, Suite 5, Santa Barbara, CA 93101. For information on SERIES training, contact the SERIES office, 4-H Center, Davis, CA 95616.

Finding the Balance, For Earth's Sake--A New Bioregional Approach to High School Environmental Science

Dennis Minty

Introduction

The province of Newfoundland and Labrador, Canada has developed a new high school environmental science curriculum that has implications for other regions of Canada as well as other countries. Entitled Finding the Balance-For Earth's Sake, the course takes a bioregional approach focusing on the immediate region and helping students make inferences of a more general or global nature. The curriculum grew from a frustration in students and educators with the lack of resource material that reflected this province. In recognition of this problem, the Department of Education decided to commission a new environmental science course for the province.

When the development process started, it became evident that there were no similar models in Canada. The publisher, Breakwater Books Ltd., considers this curriculum to be first in a series which could cover other Canadian regions and possibly other countries.

The curriculum helps high school students to examine a number of environmental issues, both local and global, and to develop lasting skills to evaluate both these and other issues. It also develops pride in place and a caring attitude towards the planet. After a full year pilot process, Finding the Balance was established as a part of the science curriculum and students began using the course materials in September 1993.

Approach to the Development of the Curriculum

For the purpose of this course, environmental science is described as follows:

1. Driven by issues, it is the study of how human activities influence the environment and, to some extent, how the environment influences human activities.

2. It is interdisciplinary. Based on ecology, it extends further, embracing economics, ethics, law, politics, culture, history, the arts, and so on.

3. It is dynamic, changing constantly. Students are encouraged to use the textbook content as a springboard to investigate the latest developments associated with any particular issue.

4. It should not be seen as black and white, right and wrong. Environmental science requires balancing the points of view associated with issues in determining the best solutions.

5. It involves an examination of values-our own, those of other people and the institutions of which we are all part.

6. It emphasizes decision-making and problem-solving processes. Students develop the skills needed to analyze issues--to examine all sides and to weigh these against a background of ecological principles before finally formulating an opinion.

To a considerable extent, the curriculum breaks the mold of many traditional science courses. The authors wanted to challenge and interest as many students as possible with the objective of developing environmentally responsible citizens, no matter what their career choices.

The course appeals to a variety of learning styles. It acknowledges that many students have difficulty with traditional approaches which often rely heavily on the cognitive domain. Often the teaching methods and resource materials do not appeal to individual students preferred learning styles. The authors have tried to avoid this problem by making this course exciting, relevant, provocative, and student-friendly by employing imaginative teaching strategies, with a heavy emphasis on hands-on experiences.

The course attempts to involve and empower students, building in them the belief that individual action can make a difference. Maintaining a sense of hope is critical in the face of the many daunting issues that can overpower young people.

Unlike most science courses, this one has strong appeal to the affective domain. This is necessary to foster in students a sense of caring and responsibility. Appealing to the affective domain and developing a caring attitude can also open gateways for many students who might otherwise fail to become engaged.

Finding the Balance weaves in the concept of sustainable development through activities, questions that encourage critical thinking and through frequent mention within the context of the issues.

The curriculum emphasizes the local/global linkages. This bioregional approach helps counter the feeling in students that global issues are too distant from their everyday world. It helps them make the connection between issues in their own backyards and those in the global environment.

Course Materials

The course materials consist of a student text and a comprehensive Teacher's Resource Book. The materials are divided into three units: Basic Ecological Concepts, Local Environmental Issues, and Global Environmental Issues.

The purpose of the first unit is to help students understand the nature of environmental science and basic ecology. The unit provides a solid foundation for more complex ideas associated with environmental issues covered in Units II and III. It takes a telescoping perspective progressing from the earth as a whole, to the biosphere, to biomes, to ecosystems in general, to ecosystems of the province and finally to the ecoregions of the province. It is intended to give students the 'big picture' and an understanding of where they fit in.

The second unit on local environmental issues consists of an examination of specific case studies in Newfoundland and Labrador and helps students develop the ability to analyze and make their own conclusions about these issues. It takes a balanced perspective bringing out all sides of the issues and seeks to involve students in making social, economic, ethical and political connections. The issues covered are Northern Cod, Municipal Waste Management, Low-Level Military Flight Training, Moose and Caribou Management, Wilderness Areas, Newfoundland Pine Marten (a threatened species), Forest Management, Pulp and Paper, Mineral Exploration and Development, and Aquaculture.

The third unit provides a brief background on each global issue followed by extracts from the writings of many people representing different points of view. Students analyze each issue through questioning, activities, research, and the application of critical-thinking and problem-solving skills. The issues covered are: Tropical

Rain Forest Depletion, Acid Precipitation, Ozone Depletion, Global Warming, Ocean Pollution, Search for and Use of Energy, and Hazardous Waste.

Student Text-Design Elements

A number of design elements in the student text warrant special attention. Vocabulary and readability are given special treatment, with all new words being defined either in the text or in the margins. A comprehensive glossary is also provided. The writing style is direct and personal so that important ideas are clearly communicated, but not oversimplified.

Graphic components are abundant and are important learning tools. They are used to appeal to the affective domain, illustrate concepts, evoke responses, and help students practice their interpretation skills.

Each chapter incudes A Closer Look, which helps students develop a broader and deeper understanding of certain concepts and link them with the real world.

Each chapter dealing with issues concludes with an element called Students in Action which explores specific actions for students to take to help address that particular issue. They are intended to help students feel empowered to make a difference.

In every chapter there is a section called Analysis. Following the Bloom taxonomy for learning, they are generally questions that solicit comprehension, knowledge, analysis, affective domain, application, evaluation, and synthesis. Answers to all the questions are provided in the Teacher's Resource Book.

Most chapters include activities within the text as well as in the Teachers Resource Book. These are an integral part of the course through which the learning objectives are met.

Each chapter ends with an element called Last Thoughts, which helps students understand continuing developments associated with the issue and helps them reflect on their personal responsibilities associated with it.

Throughout the entire text, linkages with culture, the arts, and history are included to extend science teaching beyond rigid boundaries and touch hearts as well as minds.

Teacher's Resource Book

The Teacher's Resource Book, published in a three-ring binder format, is divided into three main sections: 1) an introduction to the course-learner objectives, philosophy of instruction, and instructional strategies; 2) a chapter-by-chapter teaching guide including over 50 activities, and 50 black-line masters; and 3) a field guide, covering the administration of field trips, detailed information on local ecosystems and ecoregions, keys to plants and animals, and descriptions of field techniques for data collection and environmental monitoring.

Adaptation for Other Areas

The structure of the course material is designed for adaptation to other provinces, states or bioregions. Most modification would occur in the unit dealing with local issues. The publisher is already working on an Atlantic Canada adaptation and will extend this to other areas by working with resource people in each region, state, or province.

Conclusion

Many jurisdictions are resisting the establishment of a distinct environmental science course and favor integrating environmental education throughout the curriculum. Although the infusion approach has some benefit, it need not stand alone. The developers of Finding the Balance, believe that formal school systems should still consider the merits of having a separate environmental science course at the high school level. Doing so does not detract from blending environmental education throughout the curriculum; rather, it would help students synthesize their previous learning about the environment and apply it to current issues at a time when they are developing a social conscience and considering their place as workers and decision-makers in adult society.

Extending Collaborative EE Beyond Borders

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In focusing on the role of universities in the creation of an alternative environmental culture, one becomes increasingly aware of the limitations of any one institution or entity meeting the diverse needs of peoples throughout North America. In order to have any significant impact upon the environmental problems faced in North America strategies employed must have partnerships for collaborative efforts as their main pillar of strength. This paper identifies possible roles for universities in establishing this environmental culture and draws upon specific examples from Canada where collaborative strategies have proven to be effective in terms of promoting an environmentally educated citizenry and also providing a solid basis for a sustainable integration of social, cultural and economic characteristics related to the environment.

The universities, colleges and institutes have a major role in diffusing knowledge of existing technologies among practitioners in our own labor force. These institutions also play a major role in Canada's efforts to share its technology and expertise with other developing nations through international training agreements.

In addition to the dissemination of applied technology training, our universities, colleges and institutions are also an important focus of community development. Within their respective regions, they are vital training centres for a wide range of roles in society and the economy where decisions will be made about the allocation and use of physical, biological and social resources. The attitudes which are fostered in children through contact with childcare workers are no less important to the future of environmentally sound development than are the skills of technicians and engineers. It would be hard to imagine any area of training in Canada's post-secondary institutes of technology which will not be affected to some degree by the urgent challenges we now face in discovering and applying more environmentally sustainable forms of development activity.

In Canada a number of efforts have been launched through our Green Plan and discussions centering around National Roundtable efforts dealing with the environment and economy to identify environmental advocacy roles for professional educators and researchers associated with colleges and universities. Most of those efforts have identified parameters which include a corporate citizenship, academic programming, and some form of community outreach. In general, eight different areas have been identified in the Green Guide (NRTEE, 1992) which include the following:

- Curriculum Design/Student Projects

  One of the most effective ways of instilling an environmental ethic in students is to keep returning to the concept of environment in a variety of concepts.

- Consulting

There is a shortage of professionally trained communicators available at low cost to help community groups formulate and express their opinion on environmental issues. As consultants to these groups, university personnel can be a valuable community asset by contributing their professional networks and training to help communicate a local position.

- Research

Because of their academic training, it is possible for university and institute staff to take on their own research programs, which helps them to remain current in their field as well as providing students with opportunities to become involved in real field work, which develops direct link between the local community and the research community.

- Public Involvement

As environmental impact assessment capabilities mature, it is likely that more development issues will be subjected to public review. Personnel will be well placed to assist other groups through various consulting arrangements to answer specific questions through local research networks and to contribute their opinions directly to debate.

- Co-Management

In many area, as the result of aboriginal land claim negotiations backed up by recent court decisions, a host of co-management institutes has arisen to provide governments with direct local input in management decision-making. University personnel staff can be particularly effective co-management board members because they are familiar and comfortable with bureaucratic and collegial modes of decision-making, and are also comfortable and sensitive to local customs and decision-making.

- Non-Government Organizations

Environmental NGOs have become effective lobby groups at all levels of policy making. They are a valuable sounding board for political decision-makers and have become effective at promoting their environmental agenda's at the international level. Again, because of their communications skills, academic background and local perspective, personnel can be effective advocates for the environment through their affiliation with their chosen non-governmental organizations.

- Municipal Government Involvement

A popular slogan of environmentalists is to "think globally, act locally." Local decisions are the ones most likely to direct impact on one's daily life, yet many people think of local government as junior and therefore less important than regional and national level politics. However, opportunities do arise to advocate an environmental perspective via the local government.

- Media Relations

The media are an increasingly effective educational tool. Good media relations can greatly enhance one's ability to be an effective environmental advocate. Often reporters will be looking for someone with local knowledge and credibility to comment on controversial environmental issues. By making themselves available, university personnel can act as resource persons to the media and advocate environmentalism effectively at little cost.

No matter which of these components are going to be included in the directions of universities in seeking professional responsibility towards environmental protection and strategies for promoting lines of academic research which will help shape professional groups in the environmental field and emphasizing the new environmental culture, if we want any of these things to survive the political, social, and economic pressures of the 1990s, these things must be built directly into the mission statements and mandates of the institutions so they become responsibilities, not added on niceties.

I would like to provide an example from Alberta, Canada where a very successful program has focused on professional development of teachers and development of partnerships which in the example being shared are helping Albertans move towards an environmentally sustainable agriculture which promotes the maintenance or enhancement of the natural resources that the Agri-Food sector uses or effects, while ensuring environmental, economic and social integration.

The past four years have seen the mandatory implementation of new junior and senior high school curricula which contain numerous environmental themes. Many changes have been perceived to be presented in the new curriculum and with these come a number of implications for teachers and administrators. As most that have spent any time in a staff room can testify, and now verified in the report of the ATA/ASTA Committee on Teacher Stress (1990) next to a heavy workload and the lack of time during the school day to get work done, curriculum change implementation and accommodating to curriculum changes rank in the top five sources of work related stress in educators. Combine this with what administrators deal with on a daily basis that is a significantly higher than ever "burnout" rate for teachers due to a feeling of lack of personal accomplishment, points out that several questions need to be answered in order to provide for the success of the new curriculum related to the environment. Among the many areas of concern raised by teachers is always that of inservice. Traditionally a great deal of and effort is put into the actual design of educational innovations and curricula with very little effort put into the implementation process. Usually Alberta, the Alberta Teachers' Association, school districts, universities and other agencies have worked independently in initiating and implementing teacher development programs. In 1979, Alberta Education undertook a study of teacher inservice training costs. This study was directed to assessing the costs of teacher inservice education associated with the implementation of new programs. One of the particular aspects the study addressed was province-wide expenditures on teacher professional development and instructional staff inservice training. The study utilized the Department of Education's financial data and local school district data to analyze historical and planned inservice costs. It took into consideration direct expenditures by school authorities, indirect expenditures by school authorities, Alberta Education expenditures, expenditures by teachers and the ATA. Examples of the expenditures noted include:

- Direct expenditures reported and audited financial statements; $4,136,326.00
- Indirect expenditures prorated portion of teachers' salaries:
    1. Conventions and PD Days; $10,501,480.00
    2. Attendance at inservice seminars and Institutes; $9,240,000.00
    3. Substitute teachers' salary for teacher release time-seminars and institutes; $4,620,000.00
- Estimated Alberta Education expenditures:
  ROE Program implementation (seminars and Institutes); $1,176,000.00
- Estimated expenditures by individual teachers and by the Alberta Teachers' Association on behalf of Teachers 1978-1979; $7,622,488.00

Remember that was fourteen years ago in 1979 dollars. It certainly was a sizable sum. In 1988 the program delivery division of Alberta Education used that information along with the Canadian All Item Consumer Price Index (CPI) to generate extrapolated 1988 expenditures for teacher inservice education and professional development. From 1978 to 1988 the Canada All Item Consumer Price Index had risen from 67.9 to 140.8. If the 1988 extrapolation was even in the ballpark then we were now looking at:

Direct expenditures reported	$7,902,234.00
Indirect expenditures (conventions, etc.)	$46,541,33.00
Estimated Alberta Education expenditures	$2,246,686.00
Estimated individual and ATA expenditures	$14,562,364.00
Total	$71,252,617.00

spent on teacher inservice and professional development in a single year. That figure would not include special ear-marked funds such as those now present for the implementation of the new science program. Regardless of how accurate those extrapolations were when validated through a formal audit (if that were possible) it becomes quite apparent that whether we are referring to seventy million or fifty million that is absolutely necessary for someone to be accountable for these monies (Mrazek, 1991).

As we all know this task is left to Alberta Education and A.T.A. officials and, more importantly, school administrators. So the question arises, how do we get there from here?

A Different Way of Viewing Environmental Curriculum Implementation

This article will address some of these questions in order to provide an approach to thematic teaching of the present and new curriculum and how effective implementation can be ensured by engaging interested, keen teachers in a special form of professional development. Before focusing on this form of professional development, some background information related to the specific content being addressed as the vehicle for this professional development must be shared.

One of the environmental and science related technological and societal issues is agriculture. The North American Association for Environmental Education in its Essential Learnings in Environmental Education (1990) identifies concepts related to agriculture, water, forests, wildlife and fisheries as core components of science and environmental education essential learnings. These are also integral components within science and environmental methods classes taught at the University of Lethbridge based on a science-technology-society-environment theme.

Agricultural education itself has been a formal part of senior high programs since 1952. In the last 10 years it has taken on increased importance and been extended throughout the elementary and junior high school levels as well.

Agriculture Related Curriculum

Few Alberta teachers are familiar with the Land and Life program which was piloted in 1979. The program was designed to enhance the concepts of earth science studied in the Grade 8 curriculum by offering an option at the Grade 9 level. The program had its beginnings in May, 1975, when the Secondary Curriculum Board approved the development of a new secondary school program entitled "Land and Life." The proposed program would replace the agriculture A-Option at the junior high school level, and the forestry, horticulture, and agriculture courses at the senior high school level.

Land and Life 9 made an attempt to give students the opportunity to better understand the environmental factors in Alberta as they are affected by natural and technological forces. The core of the course was devoted to Alberta studies which included the landscape, climate and weather of Alberta. Studies of our natural resources, interaction of the physical environment of Alberta with plant and animal communities (including human settlement), and impacts of human activity on our natural environment rounded out the 50-hour core portion. The elective portion of 25 hours allowed a choice of investigation in the areas of food production, environmental pollution, man in the environment, and ecology.

Unfortunately, the program did not seem to get the support which had been anticipated and apparently "went nowhere" though it was intended "as having a strong environmental focus with particular emphasis on resource management. The content of the proposed program would deal primarily with Alberta," (Mrazek, 1983a).

While satisfying the science credit requirement for the high school diploma, Land and Life would cut across the traditional discipline boundaries in its coverage of topics pertaining to the renewable and non-renewable resource base of Alberta. Further, the program would possess a vocational emphasis to encourage students to consider careers related to agriculture, forestry, horticulture, energy and the environment" (Alberta Education, 1982:1).

In 1982, Land and Life Program-A Prospective for Development was presented to Alberta Education. The objectives of the program were:

1. To develop student awareness and appreciation of Alberta's rich heritage of natural resources.
2. To develop student understanding of the importance of these resources to Alberta and the need for appropriate management practices to meet present and future needs.
3. To develop background experiences and competencies that could lead to post-secondary education, or job entry in those fields related to agriculture, forestry, horticulture, energy, the environment, and recreation.
4. To develop critical understanding of the [illegible] and management of Alberta's resources from a personal, social, economic, political and environment perspective.
5. To meet the needs of students interested in pursuing studies in agriculture, forestry and horticulture (Alberta Education, 1982:2).

The program was to be entered at either the Grade 9 or 10 level by the following process:

> In Grade 9 the program is available as an A-Option in Agriculture. When this route is chosen, the course content is locally determined to cover areas of interest to students.
>
> Students may also enter Land and Life at the Grade 10 level, with or without having taken the Grade 9 Agriculture A-Option. Course content at the Grade 10 level is prescribed for the purpose of providing a strong concept base for topics covered at the Grade 11 and 12 levels. Flexibility in the choice of topics increases at the Grade 11 and 12 levels (Alberta Education, 1982:2).

The big question in 1983 was "what happened to the Land and Life program?" It seemed to disappear from the curriculum development scene completely. Well, it appeared about five years later and was included in 1989 in the Alberta curriculum as a complementary course-Agriculture: Land and Life under the practical arts listing of provincially authorized courses. One of the key players in this resurrection was Alberta Agriculture who also provide the Ag in the Classroom Program and support materials covering Grades 1 - 12. The programs tend to span the curriculum with advice and directions given for incorporating the concepts within specific subject areas such as science (as recommended materials) and also specifically within the agriculture courses as basic resources. This example, like many others involving curriculum development in Alberta, has not been followed with inservice of practicing teachers by Alberta Education or the offering of methods courses for potential teachers at the preservice level.

Innovation and Inservice

Traditionally a great deal of time and effort is put into the actual design of educational innovations with very little effort put into the implementation process (Campbell, 1989). Usually Alberta Education, the Alberta Teachers' Association, school districts, universities and other agencies have worked independently in initiating and implementing teacher development programs. For professional development of teachers in Alberta to be successful it must take place within the context of educational innovation and change. One of these contexts is the format for presentation which, in the case of the summer Agricultural Education Institute, is one of a collaborative and cooperative nature. The actual institute is only the beginning of the professional development, which must be viewed as a process whereby teachers refine, extend and improve their instructional practice related to agricultural education. Genuine change comes from within; you cannot impose professional development, you can only encourage it. At some point, significant change occurs through what some have called a paradigm shift where there is a new way of thinking about old problems (Mrazek, 1993).

Acceptance (or rejection) of educational innovation seems (Butt & Olson, 1983) to be a function of the realities of classroom practice; and must be seen by the practitioners as a viable solution to a practical problem to earn even consideration, let alone acceptance. Teachers on the whole tend to be quite conservative, more often simply "adding" innovations on to existing practices where they can be made to fit and rarely restructuring their classroom practices to take advantage of the innovation leading to what some call the 'packed or overcrowded' curriculum. Innovations which are adopted by teachers are those which fit easily into existing classroom structures-teachers tending to shape implementational strategies to their own particular situations and priorities.

Implementation of any innovation (technological or otherwise) is a function of (a) the nature of the innovation itself, (b) the political characteristics of the school system involved, (c) the nature of the individual school and staff affected by the proposed change, and (d) external factors such as governmental support and assistance (Kelsey, 1988). Successful implementation of innovative practices or ideas seems to hinge upon a sense of ownership of the innovation on the part of those directly involved (Woodward & Mathinos, 1987). As well, the implementation of any innovation, whether initiated from the "top" or the "grassroots" level, begins with the perception by the shareholders of a "need to do something" (Zais, 1976). A needs assessment subsequently leads to a master plan and a logistical analysis of the practical means for successful implementation. Innovators and early adopters can serve as models by which others can evaluate the innovation for themselves. Successful adoption of any innovation depends upon the perception by the majority that the innovation meets their own specific criteria for positive change. Adoption by a majority follows from awareness and interest to evaluation, personal trial and acceptance. Various uses and users elicit different concerns with acceptance or adoption of any innovation dependent upon each unique perspective and context (Wedman, 1986). The innovation process, as it applies to the introduction and acceptance of thematic science-technology-society-environment programs such as agricultural education, by classroom teachers appears to be bound closely to the specific ideological and contextual environments of each practitioner (Lieberman & Miller, 1984). Some (the "innovators") seem to embrace and promote innovation wholeheartedly; others ("implementors") evaluate, analyze, and synthesize innovation concepts and practices in a much more conservative (though by no means negative) fashion; and still others ("reactionaries") seem to resist change at all costs, displaying at best indifference, if not open antagonism.

Professional Development Institutes

How does one reward innovative teachers, implement a new curriculum, and work on community ownership of new programs simultaneously? One way is through a vehicle called an "institute". In Education we usually consider an institute to be a brief concentrated program of instruction offered to a group having some specialized occupation or a school, often within a university for research and instruction at a post-graduate level in some highly specialized subject. In part this certainly would describe one aspect of the summer Agricultural Education Institute. But other aspects of the definition should also be taken into consideration such as "to institute" would be to set up or to establish and thereby bring into use or practice and as well as "institute" being used as a noun to describe a societal organization for carrying on a particular work of literary, scientific or educational character.

The central focus of an institute, no matter which definition we are operating from, is for the professional development of teachers (Mrazek, 1987), in this case using Agricultural Education as a central theme. Historically in Alberta we have been very successful in the production of new curricula but far less successful in the implementation of educational changes intended by new curricula. In order for any real change to take place teachers must have a clear understanding of the innovation and how to implement it before they will adopt and believe in the innovation or curriculum change. This has not always taken place.

In the past criticism of current inservice models includes three major issues (Dawson, 1978; Ingvarson & Mackenzie, 1988; McLaughlin, 1978; Smyth, 1982):

- *Lack of ongoing support*-one shot in-service models do not provide for continuing support.
- *Lack of provision for meeting varying needs*-one shot professional development activities treat all teachers the same.

There is no provision for the varying needs and expertise of teachers.

- *Treatment of teachers as passive learners*-teachers are not active learners at most professional development activities. In-service activities must actively engage teachers in learning and in their own growth.

Some of the principles set forth by the University of Lethbridge, Faculty of Education for their summer environmental and science institutes include an attempt to do the following:

- Conduct a needs assessment and base the program on needs of schools and teachers
- Set individual, school, district and provincial goals, objectives and professional development plans in appropriate context
- Plan long-range inservice projects (at least one year)
- Use active rather than passive instructional techniques
- Use a variety of delivery modes
- Use teachers as instructors whenever possible
- Include materials and techniques teachers can use immediately
- Include collaborative work between teachers
- Provide for follow-up and continuity
- Provide human and financial support to districts and schools
- Provide incentive systems for teachers
- Organize support groups
- Provide for theory, demonstration, practice and feedback
- Evaluate both short- and long-term outcomes.

The inclusion of these principles in planning professional development activities has been based on those areas of consistency in the plethora of literature related to successful professional development activities (Fullan, 1982; Daresh and McComas, 1984; Huberman and Miles, 1984; Joyce, Hersh and McKibbin, 1983; Kramer and Betz, 1987; McKown, 1985; and Purcell, 1987a, 1987b).

Institutes as Part of Teachers' Professional Development

In their Report No. 36: Science for Every Student, the Science Council of Canada (1984) made a number of recommendations regarding professional development of science teachers in Canada:

> There are examples throughout the country of quality science teaching as recommended in this report. There are exemplary elementary school science programs, there are teachers who have particular ways of teaching about technology in the Canadian context, there are inservice education programs that are school-focused and long-term. School boards and principals should, we believe, make a greater effort to recognize these innovators and use their experience for the benefit of others. Such experiences can often form the basis of useful inservice opportunities for other teachers (Science Council of Canada, 1984:54).

This led to their recommendation No. 21 which directed school boards and principals should to encourage innovation and excellence in science teaching by providing opportunities for those with particular knowledge or experience to share it with other schools and other teachers. The report also stated that if science teachers are to teach about such matters as science in the social context or the role of science in technological development then they will **need to be taught how to do so**. However, if expectations teachers have for further training is largely a matter of personal motivation then what normally results is a discontinuity between preservice and inservice teacher education and therefore most teachers will not be acquainted with these techniques. This led to the Science Council's recommendation No. 29 which states:

> University faculties of education, in consultation with other faculties within the university, ministries school boards and the teaching profession, should develop and test new models of continuous teacher education with both preservice and inservice components (Science Council of Canada, 1984:57).

In addition recommendation No. 30 suggested that:

> Ministries of education, in conjunction with faculties of education, should establish special summer institutes in science education for the purpose of upgrading science teachers lacking appropriate preparation, and take all necessary steps to ensure that teachers needing to attend them are able to do so (Science Council of Canada, 1984:58).

Unfortunately in reading through the Science Council's report and major recommendations, there seemed to be an artificial separation between innovative teachers, who supposedly already had the background being sought and were presently doing wonderful things in their classroom, and that group which would be the recipients of the information being shared within these institutes. Terminology such as "upgrading" and "to insure that teachers needing to attend them" tends to restrict innovative teachers to a role of giving rather than sharing or learning themselves. What might happen if those roles were reversed? If one were to make the assumption that all of us as educators have strengths to share with others but at the same time have areas of need where we can learn from others, then the institutes being used for professional development of science teachers may take on a different appearance.

The Agricultural Education Institute (Education 4803/4804) is designed to assist teachers in developing effective techniques for studies of our interaction with the physical and human environment and their application to the field of Agricultural Education.

The approach in the course is developmental using a format developed for use in the Environmental Education Institutes offered by the University of Lethbridge, Faculty of Education, where an awareness through to action model is followed (Mrazek, 1983b).

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Institutes as a Reward for Innovative Teachers

In the summer of 1990 the first Agricultural Education Institute was held in Lethbridge, Alberta. The term 'first' also reflects the Institute's uniqueness as it is the first credit offering of its kind and complexity in Canada and North America related to Agricultural education. A full-credit senior level course offering (applicable to diploma and masters programs), the institute was a cooperative venture between Alberta Agriculture's Ag in the Classroom program, the University of Lethbridge, Lethbridge Community College and the United Farmers of Alberta. The 10-day institute was designed to explore the diversity of Alberta's agriculture industry through expert guest speakers, agricultural tours and a stay with a farm family. Agricultural production, processing, marketing and research and development were all highlighted. The hands on learning was combined with practical curriculum development to enable teachers to take their experiences back into the classroom. Participants also received valuable instructional resource material and contacts with the industry for future school visits and tours. With funding support from the United Farmers Association and other industry partners administered through each of the colleges involved with this program, this unique institute was scheduled over a four-year period with Lethbridge Community College being the first in the partnership with Olds College, Lakeland College, and Fairview College offering the course in 1991, 1992 and 1993 consecutively. Alberta Agriculture was initially identified as providing the ongoing support structure between institutes with the University of Lethbridge continuing to provide the credit training experience including the development and delivery of the curriculum as well as the certification of that curriculum. The colleges involved assist the university in identifying and arranging significant field trips, appropriate industry representation, technical expertise in agriculture, and arranging classroom space and accommodation for the teachers.

One of the incredible strengths of this kind of cooperative venture which immediately became apparent was the integrity and credibility of presentation. The strengths that each of the individual contributing members brought in terms of the academic community, technical community, and industry tended to present a unified picture which would not have been possible if any one of these groups attempted to deal with these issues alone. This partnership enabled the participants to truly see a biased balanced model in operation. With the exception of one presentation during the whole of the institute, participant's journals and reflections confirm this beyond a doubt. So how would this institute encourage or reward innovative science teachers?

The support funding provides full scholarships for up to thirty teachers a year to attend the Summer Agricultural Institute over the four year period. The sponsorship includes the cost of tuition, food, accommodation and all other expenses related to offering the course. The selection criteria used to recognize the 30 participants to be included each year have been established to maintain a balance of participants from each of the five agricultural zones in Alberta, a balance between the urban and rural participation, a balance in terms of representation of divisions of education i.e. grade levels, and recognition of the participant's ability to serve in a leadership capacity in this area once they return to their classrooms. In their applications Candidates are expected to communicate how they expect the Summer Agricultural Institute to assist them in their current position and identify why they in particular should be chosen to participate in that institute. Letters of reference are supplied to support their abilities to utilize their new knowledge by informing the students and other educators about agricultural education. One of the letters of recommendation must come from the person's immediate supervisor, whether that be a principal or superintendent. Through the reference process, teachers are not only then identified to their administrators as being (or potentially) innovative teachers, but also solicits a commitment from the administrators to provide an environment in which teachers can truly implement their new skills or resources when they return to the classroom. This is one small part of the encouragement provided for these innovative teachers. It is not necessarily the acknowledgment by their schools and community as a recipient of this scholarship, nor the formal certificate and picture which acknowledges their participation in the institute. More significantly it is their new role as an alumnus of the institute and what is now referred to as an Ag Ambassador.

An unforeseen bonus also occurred with the 1990 Summer Agricultural Institute. To assist in the ongoing support of the participants of these institutes, the Alberta Wheat Pool pledged significant financial support for the professional development activities between institutes which has been identified as the Ag Ambassador Program. With these new resources and the renewed commitment from the university, college, government and industry sectors involved, a true long-term (four to five year) professional development plan will see one or more of these ag ambassadors in every school in Alberta by the end of this process.

Monitoring the Success of the Environmental Education Institutes

In order to see where participants are related to agricultural education-prior and following the institute, a conceptual framework of an Agriculture Learning situation Inventory was developed for use in measuring both the short- and long-term outcomes of the Agricultural Education Institute. This framework and subsequent inventory instrument take into consideration not only the educational concepts, skills and attitudes outlined by Alberta Education as being essential within the goals for education and schooling, but also takes into consideration the objectives of the Ag in the Classroom program, the educational emphases by Alberta Agriculture, and the context provided by the North American Association for Environmental Education in the interpretation of the Essential Learning in Environmental Education, and Albertan, Canadian, and international (UNESCO) directions in the area of Agricultural education.

Throughout the institute participants kept a daily journal which, combined with the written evaluations of the institute identifying the specific components of the course which teachers felt helped them most, components they would have like to cover more extensively, components they didn't think were applicable at that level of experience, as well as other comments they felt would help make the institute more relevant to their needs, provide extensive insights into the perceived worth of the institute in terms of the teachers own professional development. The insights provided by the teachers, combined with their pre- and post-perceptions of their teaching related to agricultural education as identified by multivaried analysis of the data from the Agricultural Learning Situation Inventory, provide a very strong basis for making statements about the success of the institutes as a professional development activity for the participants.

Pre- and post-data from the Agricultural Learning Situation Inventory were analyzed statistically using an analysis of variance (ANOVA) Analysis of various comparisons revealed that of the 72 items covering the implementation of program objectives in terms of concepts, inquiry learning, affective behaviors, psychomotor skills, teaching/learning process, teaching/learning resources, classroom climate, and evaluation of student achievement there was overall significant change (positive) in terms of teacher's perceptions of their classrooms and the role of agricultural education. Thirty-seven items were significant at the $p < 0.01$ level, 17 items significant at $p < 0.05$ level, while 18 items were not statistically significant at the $p < 0.05$. Seven of the 18 items which were deemed not to be significant at the $p < 0.05$ level were in the area related to evaluation of student achievement, which did not receive much emphasis during the institute. The greatest gain in terms of statistical significance was on item #8 "In class, students study the significance of application of agricultural concepts to their daily life." The pre- vs. post- mean difference of 1.71 with a standard error of .15 made this statistically significant to the $p < 0.0001$ level. The combined coverage of items significant at $p < 0.05$ and $p < 0.01$ was complete, that is once the objectives relating to these items were mapped, *all* objectives of the course were successfully achieved. Confirmation of this in the open-ended evaluations, journals, and resultant activities originated by the teachers in their classrooms since the institute (unit plans, lessons taught, and activities engaged in) would confirm the instructors' initial impressions of the overwhelming success of the institute in having the teachers share their knowledge and experience to raise students' awareness of Alberta's agriculture industry and the role it plays in their everyday life. This was identified as the institute's primary goal.

The Agricultural Education Institute is but one of a number of different vehicles for meeting the needs of students and teachers related to areas of agricultural, science and environmental education. The Faculty of Education at the University of Lethbridge considers itself fortunate to have the opportunity to work with Alberta Agriculture, the United Farmers Association, and each of the four Agricultural Colleges in the province in a very harmonious relationship to initiate and bring about such a worthwhile venture. We look forward to working with other groups and agencies throughout the province in similar relationships.

1993 saw the fourth offering of the Agricultural Education Institute. It has grown to include over 50 different partners from the Agri-Food industry, media, government agencies, and educators at all levels. There are over 1,000 schools in Alberta that have Ag Ambassadors to coordinate and assist in the delivery of agriculturally related programs. We now have relationships established with the various research institutes both at the corporate and government levels where teachers work with practicing scientists to learn more of the different roles the scientists play related to agriculture, the environment, and the improvement of our society. The bonds become stronger, and the team becomes larger each year. This is certainly a wonderful tribute to the integrity of all those involved in this program. We now hope that we can continue to move across Canada and throughout North America in expanding this collaborative work and sharing with others.

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Sustaining Forest Health to Benefit People, Property, and Natural Resources[1]

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Introduction

A forest health emergency exists in parts of the West: "Federal forests on the east side of the Cascades are perhaps hardest hit. Insects and disease have killed trees across millions of acres in eastern Oregon and Washington. Similar problems extend across a much larger area, south into Utah, Nevada, and California, and east into Idaho" (Gray 1992). These forests have been struck by a forest health problem of unprecedented proportions. Several factors have coincided to produce massive forest mortality. The immediate causes are prolonged drought and epidemic levels of certain insects and diseases. Beginning in the 1980's, large wildfires in the dead and dying forests have accelerated the rate of mortality, threatening people, property, and natural resources. These wildfires also have emitted large amounts of particulate matter into the atmosphere.

Historically, open ponderosa pine, larch, and Douglas-fir forests at lower elevations in the West burned naturally at low intensities every 5 to 30 years, maintaining rather open, fuel-free stands with few fir trees. But in more recent times, the larch and pine overstory was harvested extensively and fire was controlled. In the absence of fire, the composition of the stands shifted toward an unnaturally dense understory of Douglas-fir, grand fir, white fir, or incense-cedar. Spruce budworm, other destructive pests, and forest diseases have been enjoying a steady diet of stressed fir trees, leading to mortality, fuel build-ups, and high-intensity wildfires.

Our ability to sustain or restore forest health rests in large part on understanding and applying fire history, fire regime, and fire effects information to resolve complex resource management issues. Many of today's resource issues have direct or indirect relationships to the role of fire as an ecosystem process:

- Forest health
- Unnatural accumulations of wildland fuels
- Overuse of certain tree species by humans
- Fragmentation of wildlife habitat
- Loss of life and property at the wildland/urban interface
- Diminishing area of old-growth forests
- Loss of biological diversity
- Deteriorating air quality
- Global climate change
- Insect and disease epidemics
- Advanced succession of plant communities

Successfully implementing strategies to restore forest health in many parts of the country will not only require an understanding of fire as an ecosystem process, but also will require our effective communication of these fire-dependent relationships to all segments of society (school children to adults). If people do not fully understand the consequences of alternative resource management strategies, they may not be supportive of the use of prescribed fire on a landscape scale.

Many of today's significant forest health problems are associated with the long-needled pines. Because this fire regime was characterized by very short fire return intervals, successful fire exclusion over the past 60 to

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[1] Adapted from a paper presented at the Fire Working Group Technical Session of the Society of American Foresters Convention held in Richmond, VA on October 25-28, 1992.

70 years has disrupted two or more fire cycles, contributing to shifts in species composition, stand density, and fuel accumulations that are undesirable from a forest health standpoint.

A Strategy for Sustaining, or Restoring, Forest Health

Covington and Moore (1992) carried out a detailed analysis of data from two study areas in the southwestern ponderosa pine type in Arizona that suggested that average tree densities have increased from as few as 23 trees per acre in presettlement times to as many as 851 trees per acre today. Associated with these increases in tree density are increases in canopy closure, vertical fuel continuity, and surface fuel loadings resulting in extreme fire hazards over large areas never reached before settlement. In addition, they indicated that fire exclusion and increased tree density have likely decreased tree vigor (increasing mortality from disease, drought, etc.), decreased herbaceous and shrub production, decreased aesthetic values, decreased water availability and runoff, decreased nutrient availability, changed soil characteristics, and altered wildlife habitat.

A strategy to maintain forest health on long-needled pine sites clearly involves managing for considerably lower tree densities (Mutch et al. 1993). The desired stands will appear more open and park-like, and incidentally will have increased forage production. Achieving this condition will require a combination of silvicultural partial cutting treatments and prescribed fire. Low-intensity surface fires should be prescribed at about 10- to 25-year intervals to coincide with the historical fire regime. The planting of seral species like long-needled pines and larch may be necessary in some areas to re-establish these species on sites where they have been removed through logging and successional replacement. Silvicultural prescriptions need to maintain the fire-dependent seral species in the overstory.

Because many stands now are excessively dense and contain many dead and dying trees, restoration of healthy forest conditions will require different approaches from those used to maintain healthy forests (Mutch et al. 1993). Salvage logging may be necessary to remove unnaturally heavy accumulations of dead and dying trees before commencing extensive prescribed burning programs. Careful salvage will help to mitigate resource damage that might occur from more intense fires. Two or three prescribed fires at higher moisture levels may also be required over several years to gradually reduce the accumulation of fuels. Other strategies to consider might include thinning from below and the closer utilization of biomass. The structural characteristics of stands that promote torching and crowning must be changed. In the 1992 Cleveland Fire in California, for example, ponderosa pine stands survived which had received multiple and compatible fuels management and silvicultural treatments (e.g. thinning and understory burning); but there was little survival of stands where understory burning was done without thinning, thinning was done without understory burning, or no management practices were carried out.

In implementing ecosystem management strategies to sustain or restore forest health, it is helpful to develop the program around these concepts:

- Establish an interdisciplinary team process for ecosystem management
- Know the historical situation well, including fire history
- Understand the normal range of variability that occurred historically
- Assess the departure from the normal range
- Negotiate a desired future condition with all partners
- Involve all partners in developing an ecosystem management strategy
- Clearly define the consequences of management alternatives
- Implement strategies on a landscape scale
- Establish priorities to be successful with limited people and dollars
- Use large demonstration areas to reveal practices and results to others
- Develop a partnership with research to establish a sound monitoring and evaluation program as a basis for adaptive management
- Develop an organization and funding for ecosystem management from the ground up initially

- Define management expectations in terms of forest health restoration and ecosystem management goals (not in terms of functional outputs)
- Initiate an education program that carefully informs people about ecosystem management processes and practices.

Summary

Several decades of fire exclusion and timber harvest of pine, combined with drought and insect and disease outbreaks, have shifted a low-intensity surface fire regime to a crown fire regime, dramatically increasing risks to people, property, and natural resources. Now, when wildfires occur in dense stands on these sites, the fire behavior is represented by high-intensity crown fires rather than low-intensity surface fires. For more resilient and healthy long-needled pine forests, we must drastically control stocking density and species composition on a landscape scale through an integration of silvicultural and fire prescriptions.

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Pollution Prevention Concepts in Environmental Education Curriculum

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Introduction

Concerns about the environment erupted in the early 1960's over highly visible problems of contaminated water, land and air. Oil floating on the Cuyahoga River in Cleveland caught fire. Los Angeles and Pittsburgh were gray and dismal with contaminated air. Fish could not survive in many urban rivers which were dumps for sewage and industrial waste. These problems caught the attention of the public because they were unsightly, smelled and caused illness. In large part, they have been corrected through laws and regulations that forced cities and industry to treat their waste. In most cases, we did not change behavior.

Today we have cleaned up many of these highly visible problems. The Cuyahoga River supports fish and is the show piece for an urban rejuvenation program. The Hudson River and Lake Erie are teeming with life. Now we must turn to the more subtle environmental problems that are not easily observable. They include destruction of the ozone layer, the greenhouse effect, deterioration of productive lands and long term illness. To address these problems requires systematic changes in the way we do business and the way we live. To begin, we need to integrate the concept of pollution prevention into school curriculum so that students will understand the need for behavioral changes to protect the Earth.

Objective

The objective of this paper is to describe approaches for integrating pollution prevention concepts into curriculum. Most environmental efforts are directed toward waste processing, waste control and recycling. This must change. The cost of cleaning up after ourselves is enormous. New ways of producing and living must be devised to eliminate the sources of waste; that is, to prevent the creation of pollution.

Curriculum Integration Concepts

Three themes can form the basis of curriculum development and integration: life style changes, consumption changes and production changes. Following are some examples of how these themes can be integrated using educational materials that are generally available in the environmental education literature.

Life Style Changes

Problems that are invisible and more difficult to address are more pervasive. To focus on these issues, students must understand the implications of how their life styles impact the environment. Environmental audits of the school and home environment provide data for discussing how we impact production of chemical and combustion waste. Issues to discuss include:

- Use of space in the buildings in which we live and work. How would our lives change if we had to reduce our living space by 10 percent; or by 20 percent? How would this affect the use of energy and the generation of green house gases?
- Use of transportation to work and to school. How would our lives change if we did not own cars; if we had to shop and seek recreation in our immediate neighborhoods and could not take extended trips?
- How far do we travel to school? What changes in life style are required to travel less? How would our lives change if we reduced travel by 20 percent; 40 percent; 60 percent? Answer the above questions for all family travel; to work, to recreation, to school, and to cultural events.

Consumption Changes

The Pollution Prevention Act of 1990 encourages firms and consumers to voluntarily reduce waste by changing the processes that are the source of the waste. It is a proactive approach where firms look for ways to improve their environmental performance in the methods of doing business; and consumers look for ways to change the products they use and change what they throw away.

Consuming resources. Resources that are not renewable are more expensive to find and to mine as they become scarce. Alternative technologies will be needed for mining; and for resource conservation to reduce costs.

Some resources are replaceable. Forests can be managed so that harvesting and planting sustains the rate of tree growth to serve the requirements of our society. Fish can be caught at a rate that will maintain their numbers; and timing of the catch can coincide with their life cycles. Electricity can be generated with water, wind and solar power, resources that are not depleted with use. To maintain resources that are not replaceable, governments can encourage the use of sustainable resources at replaceable rates.

The following issues can be explored in the classroom:

- Explore where the school's energy is generated. What are the resources used? Are they replaceable such as water power or are they dependent on coal and oil. What are the costs of alternative energy resources such as solar? How scarce (and how expensive) will the present source of energy have to become before the community could consider changing to solar energy. What is the status of solar technology? Is this the technology of the future? What other technologies may replace the consumption of non renewable resources for fuel?

- Forests are a replaceable resource as long as the harvest does not deplete the stock. Design an in-class experiment using a fast growing plant such as grass to demonstrate the rate at which it can be cut so as to maintain a steady harvest.

Contaminating resources. Air and water are not necessarily destroyed when they are used. However, they can be contaminated with chemicals from manufacturing processes, from disposal of human waste and combustion. This makes them less useful to all living organisms and may actually cause disease and related health problems. How can these resources benefit humankind without becoming contaminated?

The following issues can be explored in the classroom:

- How is water that leaves the school treated? Does the school have its own treatment plant; or is the waste water treated by the city? How would the school administration have to change its behavior to not produce waste water? How would these changes affect you?

- How are fumes that leave the school treated? Does the school have an incinerator to burn waste? Are the fumes from the heating system treated? How high is the school smoke stack? Is this a form of air treatment? How would the school administration have to change its behavior to not produce air waste? How would this affect you?

Production Changes

How we choose to make the things we use and consume determines the waste that is generated. For example, if we make a can by cutting it out of a sheet of metal, the fine cuttings and the end pieces become waste. However, if we make it from plastic in a mold, we can pour in the exact amount of the plastic and no waste is generated. Manufacturers are making decisions to reduce waste by changing the way they make things. This may require new technology. For example, could we cut the metal for the can with more precise instruments so that the waste is minimized; or could the size of the metal sheet and the size of the can be designed in a way to minimize the waste? "Environmentally Conscious Manufacturing" is the descriptor being used to capture this concept. The following classroom activity can demonstrate this new approach to controlling waste:

> Students are asked to build a house using paper and different sets of technology. They need to make use of the technology they are provided for this defines their "production possibilities." Technology may include glue, tape, clips, staplers, scissors and pens. The class is divided into groups, each group receiving different technology. After the construction is complete, each group demonstrates how they solved the building problem with their particular technology. Examine the waste generated by each of the groups. Waste may include bent staples, cut paper, excess paper, wasted tape, pen marks and glue on fingers. Show how technology affects the waste generated.

Conclusion

Environmental protection has traditionally been based on the presumption that waste is being generated and has to be controlled. This results in a continuation of systems that generate waste and generate treatment of that waste. Exciting developments over the last five years are encouraging firms and consumers to change fundamentally the way business is conducted so that waste is not created. This provides the teacher with exciting proactive material for teaching students their personal responsibility for protecting the Earth's resources.

Using Mascots to Present Environmental Messages--What Alberta Parks Has Learned

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History

In 1992, Alberta Parks Services celebrated its 60th anniversary. Part of this celebration revolved around introducing a mascot-Seemore the Owl. These mascots (5) cost the parks about $25 000. One of the immediate reactions (by staff) to seeing our 6 foot owl was--this will be great for school presentations.

Instead of leaving it open to have staff design their own school program, it was decided to develop a pilot project. Many themes were discussed: preserving Alberta's special areas, safety, conservation messages, eco-camping and so on. It was decided for the pilot to start with a safety theme that would incorporate a number of different messages that have been developed and presented in schools by park staff.

A select number of park staff were brought together to review the initial program. From this workshop, it was decided that an actual script would be created-the park staff felt more comfortable with a script than just an outline of what topics they were to discuss. It was decided to create this pilot for elementary students in kindergarten through grade six.

Along with the script, a previsit package was developed for teachers to get their students ready for the presentation. This prepackage introduced the mascot-Seemore, had teachers discuss what parks are with their students and had them begin to think of the different things that people do when visiting parks.

A postvisit package was also developed that included more safety information, a "Being Found in a Park" booklet for the students, and information for their parents. Evaluations for both teachers and park staff were also part of this pilot.

The school programs were very successful and some minor modifications have been made to better fit both the teachers' and staff's needs. The revised program is now being printed and will be sent out to park staff early this fall.

What Was Learned

A prepared script works well, but requires time to learn and to practice. One of the major drawbacks of this program is that it takes two to do it. Seemore does not talk but communicates by gestures and through the uniformed staff member that accompanies Seemore whenever out in public. Seemore's role is to keep the kids attention and to reinforce the messages with gestures and signals.

In the past a ranger or interpreter could go to a school and deliver a program with minimum of planning, but now schedules must be coordinated, time for practice is required, and schools must be visited before the presentation.

One of the musts, found out through the evaluations, was the need for the ranger to visit the school before the performance to make the arrangements. Sometimes this is done just a few hours before the presentation but usually it was done after the initial contact with the principal or teacher. The ranger must determine where the presentation will be done. With the time being put into this performance, it is not efficient to do the presentation to one or two classes; it has been designed to be done in front of all the school. This usually means that it is done in gymnasium.

The ranger must determine if a stage is to be used (the performance works well with the kids sitting on the floor and no stage), whether a mike will be required (for the most part, the rangers feel much better just "raising their voices"), where can Seemore change and how will Seemore get to where the performance takes place. Often a teacher is required to help get Seemore to the stage, for the ranger starts and ends the presentation without Seemore. This visit is also a good time to "drop-off" the prepackage material and discuss with the principal and teachers what the performance is trying to teach.

The pilot came up with two opposite opinions on the script. The rangers found that the repetitiveness of the script was too much and that it could be shortened by saying things once. The teachers said that it was great, that the students could repeat the messages along with the "signs" Seemore used as a method of remember the steps, three and four weeks after the performance. This repetitiveness has been left in and the staff are being made aware of why this has been done-it instills the safety messages into the children ps long term memory.

It should be noted that much of this program is based upon programs that were already being done by the rangers and others in schools-these are basic, important, safety messages. The addition of Seemore to the performance has kept the kids interest high and has reinforced the messages that must be learned. Seemore has proven to be a good teaching tool for the younger grades; the program has been rewritten for kindergarten through grade 4. The grade 5 and 6 students were not as "keen" on Seemore as were the younger grades.

An interesting side line in the development of this program arose after the pilot. Many of the staff who did the pilot were anxious to continue with it. Middle management wanted the program stopped and upper management, knowing the investment in time and money that has been put into Seemore wanted it continued.

The problem here was time. With over 1000 elementary schools and reductions in permanent staff over the last few years it was felt that it could not be done. Given current staffing (a qualified uniformed person must accompany Seemore) it could take up to 3 years to visit all the schools if each person did about 10 schools a year. The real problem was doing the urban schools. Parks near large urban centres are not looking at reaching the local 5 or 6 elementary schools that their parks serve but literally hundreds of schools. Even hiring a team of people to go into the schools would require at least two years to visit all the schools in the province.

Middle managers were not willing to commit the resources needed to get to all the schools in Alberta over the next year or two. What has been decided is to allow those rangers that are keen on the program to work with a volunteer Seemore (staff member or park volunteer) and do the schools that they feel will best value from the presentations. This will allow those rangers who want to go to the schools to do so and also allows us to follow the wishes of our senior managers of getting our messages out to the public. This process will be monitored and evaluated this year and recommendations on its successfulness will be made to senior management.

The next topic planned for Seemore school programs is on the role of parks in conservation of special areas. It was planned to start the development and piloting of this program in 1993 after staff have been trained on the initial safety program. Given concerns about staff time and costs this next program has been put on hold for one year. After the 1993/94 school year the entire program will be examined and recommendations on the continuation of the safety program and the development of the conservation program will be made.

There is no doubt that using a mascot to reinforce learning both in a park and school settings works. The only problem is that with reduced manpower the ability to deliver the program to all the people interested in it is not possible. The net results of what can be accomplished using the mascots appears to outweigh the costs for them and the money needed to upkeep the costumes and transport them around the province.

Re-thinking Environmental Issues--An International Agenda

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Why is Environmental Education becoming a national priority for many countries? As environmental educators we are aware of the milestones, Stockholm-Belgrade-Tbilisi, and the work in the 1970's with the various Ministries of Education and their ministerial counterparts to incorporate EE into their policies and implementation of environmental programs. Yet Environmental Education no longer simply implies formal education. It is now being identified as part of a broad national agenda. What is happening?

First, in the last three to five years there has been a substantial strengthening of environmental institutions including a proliferation of environmental protection agencies with legitimate political power and a substantial increase in the appropriation of funds.

Secondly, the international community over the last decade has increasingly made it known that environmental standards have to be addressed, especially in terms of air quality, toxic and hazardous wastes, endangered species, dumping, biodiversity, and ocean ecosystems.

Additionally, there is no doubt that UNCED has led to basic shifts in the administration, political, and intellectual context in which environment and economic development are framed. Since the early preparation meetings and writing of country reports in response to Agenda 21, countries are now in the process of reviewing their national environmental agendas and re-defining environmental policies in terms of the final UNCED documents and treaties. Relationships and roles at the national, regional and international levels are beginning to be re-shaped in terms of more interactive approaches. For example in Northeast Asia, there is an expressed concern between Far East Russia, Korea, Mongolia, Japan and Mongolia regarding the establishment of common environmental standards and putting into place mechanisms to facilitate a system of communication.

The model of "Our Common Future" has presented a challenge to environmental professionals world-wide to focus on defining solutions. This shift in thinking about environmental issues has taken decision makers beyond traditional approaches such as legislation, regulation, and enforcement; protection and conservation; scientific research; and technological solutions.

In part, this is due to the fact that much of the current data regarding the state of the environment reflects the dynamics of the ever-changing processes that define the health of an ecosystem and by default the health of our human systems. Emphasis is increasingly being placed upon those "processes" and "systems" rather than problem specific concerns. Environmental policy making now means pro-active approaches that cross sectors, national boundaries, and cultural contexts. Consequently, within a country's environmental community, skills now include Environmental Education, public awareness, and community action.

Of these three, public awareness is given a lot of attention both by the country's policy makers and the bi-lateral and multi-lateral funding institutions. Community action in conjunction with the work of NGOs is increasingly valued as a means to raise public awareness and in turn influence reluctant politicians to act. What is interesting is that it is Environmental Education in its broadest sense which is viewed as the critical strand for accomplishing a country's goals in achieving a sustainable future. Essentially, there are three fundamental components influencing an identified need for these skills.

First, in the early 1980's, advances in computer technology and satellite imagery broadened our perceptions of environmental issues by providing a medium to understand the scale and complexity of the problems. We now have the capacity to model complex systems and are just beginning to understand the profound interrelationships. As a result, we are having to create new institutional structures to reflect these new realities as we go along.

We can observe this within our own national agendas. For example in the United States, there have been discussions over the last year about the need to re-visit the idea of creating a department of the environment, the re-defining of the mission in the State Departments' Oceans and Environment Program to one of "Global Affairs", and the recent action taken by Interior Secretary Bruce Babbitt to create a new scientific agency, the National Biological Survey (NBS) modeled after our USGS to develop a kind of biological-ecosystem map of the country that will serve as an early warning system of impending ecological disaster.

This leads us to the second fundamental change in our thinking about environmental issues and the role of Environmental Education. Humans are no longer considered an external agent acting upon the environment but are viewed as essential components of the Earth's natural systems. As environment and development issues become more global in scope, the strict dividing lines between foreign and domestic environmental policies soften. Simple alignments of North-South or East-West are permeated with elements of the one found in the other. While science can attempt to evaluate the functions and risks confronting human and environmental systems, solutions to the major environmental issues ultimately are requiring public choice and public responsibility. For the international community this state of affairs is beginning to raise important questions regarding what do we need to protect, how, at what cost, and who else should be involved in making these essentially value-based decisions.

The third essential tenet to defining a future course of action is Environmental Education. Most everyone in the international community at some level is struggling to make sense of how to balance economic priorities with environmental concerns. We are good at generating data about the environment or the specific problem. We are less effective in a) knowing where to begin to ensure we have good access to "the best information available" b) knowing how to communicate our ever-changing knowledge about the environment to our colleagues and the general public and, c) knowing who to engage in defining solutions.

What is interesting, we are coming to the realization that an effective strategy is dependent upon the identification and utilization of essential target audiences. Not just in terms of their appropriate role but also in being able to understand their interrelationships with each other. As laid out earlier in the Tbilisi documents, the emerging essential target audiences are:

- The General Public--In school, out of school, the community-at-large and the informal social networks of daily life.

- Social or Occupational Groups--People who not only serve the public but also move among many circles of influence and develop information germane to shaping policy.

- Environmental Scientists and Technicians--This piece of the puzzle is important because it informs us about "the best available information". These professionals essentially wear three hats. The first hat is the generation of critical information about the environment. The second is the need to be able to communicate that information to a broad professional audience. And finally, to identify critical areas for continually providing professional development training that reflect our new understandings, especially regarding the creation of a system of communication.

Unfortunately, the symbiosis of these three target audiences is often overlooked. The consequence of the current approaches to Environmental Education is that funding is often limited to the familiar rubric of public relations and public participation activities for a given project, minimizing the potential impact of the organization on environmental problem solving. The gap between concept and methods is great. One of our objectives as environmental educators therefore is to bring our ideas into a working reality with the decision makers and the essential target audiences, separately and as an interactive whole.

Internationally, which includes the U.S., Mexico and Canada, the central questions we should be asking ourselves are:

"How do we mobilize this "public" to help us develop ecologically sound environmental policy?

"What kind of communication mechanisms and professional development programs are key to a country's long term environmental agenda?"

Consideration of Agroecosystems is Essential in Holistic Environmental Conservation and Management

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Agriculture is widespread, fundamental to human society, and is a principal occupation or industry of millions of people. Agroecosystems--cultivated ecosystems populated chiefly by genetically specialized, domesticated plants, animals and/or microbes under intense human management--occupy and draw upon the resources of vast areas of land around the world. Agroecosystems and agricultural activities interact with and impact wild ecosystems in many significant ways, some of which fuel controversies and tensions in the environmental community and are major issues in environmental education, policy making, research, and management.

Agriculture, other human endeavors, and natural processes throughout history have greatly reduced or modified wild ecosystems and reduced biotic diversity, creating the need today for deliberate conservation management. Massive efforts are underway to explore, characterize, and evaluate surviving ecosystems and to inventory their species for purposes of conservation. The holistic concept of ecosystem conservation adds complex dimensions to wildland management. For these reasons, and to expedite progress, all applicable knowledge and expertise must be identified and brought into the management effort. An abundance of such resources exist in agriculture. Unfortunately, because of a lack of familiarity with the subject and negative perceptions, many professionals in environmental education, science, and management have overlooked agriculture as a potentially valuable partner and resource.

It is time for a more complete awareness of and vigorous cooperation with agriculture in the pursuit of environmental conservation and management. Partnerships with agriculture promise realistic, constructive, and holistic attitudes and approaches for problem solving in environmental research, management and remediation. Diverse knowledge already gained by agricultural research on organisms, soils, water, genetics, physiology, pathology, population dynamics, and other concerns in agroecosystems has great potential for scientific and technical transferability to wildland management. Opportunities for partnerships exist in many areas of research and application, and promise benefits for both agriculture and wildlands. Many agriculturists possess insights and abilities potentially transferable to wildland studies. Conversely, people familiar with wildland species and ecosystems could make valuable contributions to emerging areas of agriculture such as sustainable farming systems and the biological control of diseases and pests.

Understanding of the biological, physical, and functional similarities, differences, and interrelationships of wild and agricultural ecosystems provides essential, practical insights into the management of compatible and sustainable systems. Similarities include common genetic bases, similar qualitative nutrient requirements, common soil requirements, and dependence on, or impact of, microbial interfaces or symbiotic associations in carbon cycling, other life-support activities, and disease. Differences include mutually exclusive ecosystems developed through different evolutionary adaptations, markedly diminished genetic diversity in agroecosystems, greater nutritional and other input demands in agricultural species, greater potential for soil erosion in cultivation, and strong exclusionary and genetically selective pressures imposed on microbial species and populations under agriculture. In spite of their different evolutionary backgrounds, the common, original genetic base and physical environments of wild and agricultural biota explain certain interrelationships and potential pressures existing between the two ecosystems: shared arthropod and microbial associates, similar health problems, competition for habitat space and resources, and the impacts of soil and water perturbation caused by agricultural activities.

Potential Benefits of Partnerships

A general benefit of networking people inside and outside of agriculture is a more realistic, direct, and productive forum within which solutions to problems in environmental conservation can be debated, developed, evaluated, and implemented for a sustainable biosphere. Specific examples of cooperation and possible agricultural contributions are presented below.

Agricultural expertise in the science and technology of integrated management of soils, organisms, water, nutrition, and other ecosystem factors offers organizational and procedural insights for potential application in wild ecosystems, particularly where transitional solutions are necessary to foster restoration.

Conservation of genetic diversity is a major goal in environmental management. Domesticated plants, animals, and microbes evolved from wild ancestors and today constitute unique and valuable sources of ancestral genes that could be used in restoring elements and benefits of diversity to natural populations, or in providing new disease-resistance potential to species through biotechnology. Agricultural organizations around the world, including the United States Department of Agriculture (USDA), maintain repositories of both wild and domesticated "germplasm" (animals, plants, and microbes or their propagules) available for use. Restoration of certain species to remediated ecosystems from such germplasm banks is conceivable.

There is a critical need for understanding and managing the diversity and ecology of microbes in wild ecosystems. Microbes constitute essential interfaces in the functional web of ecosystems. Wild organisms and their domesticated relatives often share similar microbial partners in mutualistic-beneficial, parasitic, and other symbiotic relationships. These microbes and their ecological relationships have been studied most extensively in agriculture. Forestry, agronomy, and horticulture, for example, have contributed much to our understanding of beneficial mycorrhizal (fungus-root) relationships in trees and other plants. Potential wildland applications of such knowledge include disease control, soil remediation, nutrient cycling, and stand regeneration.

International programs on agrotechnology transfer and renewable resources, such as those sponsored by the United States Agency for International Development, the USDA Soil Conservation Service, and the United Nations Food and Agriculture Organization, have developed detailed knowledge on the characteristics of soils, particularly in the tropics, that could possibly support management and remediation in wildlands. Some of this knowledge has been developed and organized to facilitate its application to problem solving in environmentally related areas in different parts of the world.

Agricultural scientists are developing biological agents for the control of pests, pathogens, and weeds to reduce dependence on chemical treatments. This endeavor benefits species and habitat conservation. Some of the biological controls may be transferable to perturbed wildlands for purposes of stabilization and remediation. Conversely, wildlands are potential sources of disease-resistance genes and useful microbes for agriculture.

Biotechnical developments in agriculture promise to reduce the harvest of wild plant species by transferring their medicinal- or other chemical-producing genes to cultivated microbes or crop plants for mass production.

Current agricultural research, development, and policies are strongly directed toward sustainable systems with fewer inputs, recycling of biomass, soil and water conservation, and more reliance on natural systems for achieving acceptable levels of pest and disease management and suitable yields.

Facilitating Partnerships

Partnerships can be facilitated by holistic education and thinking; creative leadership; broadening one's own scope of professional activity and contacts; interdisciplinary programs at universities; joint professional meetings; inviting agricultural speakers/guests to your meetings; cooperative grant ventures for education, research, and applications; creating interactive bridges and joint projects between governmental organizations; and networking approaches for solving specific problems.

Correlations Among Campaign Contributions, Environmental Votes, and Party Affiliation in the U.S. Senate, 1992

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Analysis

In earlier publications, the author has demonstrated how data from League of Conservation Voters scorecards and the Sierra Club's *Public Lands Activist* can be used to analyze the environmental voting records of every member of the Senate and House (Tanner, 1990, 1991). A strong correlation between party and voting was found, with Democrats voting for environmental protection and sustainable energy about two-thirds of the time, Republicans only about one-third. It was concluded that these results were consistent with the difference in constituencies courted by the two parties, with the GOP being especially accountable to business and industry. Data on campaign reform votes showed an even clearer party difference, with Republicans unwilling to change the present and arguably corrupt system of campaign finance, in which industry PACs create the obligations that are repaid with anti-environmental votes in Congress.

These analyses, using data that are updated from time to time, have been incorporated into my teaching for some years as learner-centered activities in which my students examine the data and generate conclusions. This paper describes the use of a new source of data, first employed in an upper-division course in energy and air pollution in the fall of 1992. The Center for National Independence in Politics (129 NW Fourth Street, Suite 204, Corvallis, OR 97330) is a new organization conducting a program of public information called Project Vote Smart. The goal of the Center and the Project is to make good data easily available to voters so that they can make choices informed by more than paid television commercials and journalists of varying quality and persuasion. The Center is a dues-supported membership organization whose nonpartisan or at least bipartisan nature is emphasized by the list of founders on its letterhead: the first four named are Jimmy Carter, Gerald Ford, Barry Goldwater and George McGovern.

In 1991 or 1992 the Center published a table, "Campaign Finance Information," showing how much money each current U.S. senator received from various categories of PACs (Political Action Committees) during his or her latest six-year fundraising period (1981-86, 1983-88, or 1985-90). The categories included, for instance, "Health," "Construction," "Labor," "Defense," "Agriculture" and seven others. For analysis in this course about energy, I isolated those eighteen senators who received more than $130,000 each from "Energy" PACs and those fifteen who received less than $15,000 each. I then referred to the 1992 Senate scorecard from the League of Conservation Voters (2000 L Street NW, Suite 804, Washington, DC 20036). There, LCV identified twelve votes as having import to them, including three they classified as "Energy and Global Warming." All of these were votes on amendments to the major energy bill which was moving through Congress at that time. The three amendments would have provided greater environmental protection by increasing energy efficiency in industry, establishing a Nuclear Safety Investigations Board independent of the Nuclear Regulatory Commission, and restoring public participation in the licensing of nuclear plants, which in the bill was reduced from previous levels. Although the three amendments might properly be characterized as somewhat feeble, votes in favor of them were counted by LCV as pro-environmental, while of course votes against them were tallied as anti-environmental.

The table shows how the thirty-three senators voted, with pluses representing votes for the amendments, minuses votes against. Students concluded that there was a striking correlation between PAC receipts and votes, and offered reasonable hypotheses--*obvious* hypotheses--to explain the votes.

Rank	Senator	State	Party	Energy Pac Contributions	1992 Energy Votes
1	Johnston	LA	D	$418,350	---
2	Bentsen	TX	D	$362,417	-+-
3	Gramm	TX	R	$318,312	---
4	Gorton	WA	R	$226,268	+--
5	McConnell	KY	R	$224,979	---
6	Domenici	NM	R	$222,990	---
7	Wallop	WY	R	$205,727	---
8	Nickles	OK	R	$190,341	---
9	Craig	ID	R	$182,208	---
10	Symms	ID	R	$177,610	---
11	Heflin	AL	D	$176,100	---
12	Brown	CO	R	$168,210	---
13	Coats	IN	R	$149,700	---
14	Simpson	WY	R	$143,250	---
15	Murkowski	AK	R	$143,005	---
16	Bingamon	NM	D	$139,873	++-
17	Specter	PA	R	$138,600	---
18	Bond	MO	R*	$134,450	---

19-83 Sixty-five senators received $15,000 - $129,000.

Rank	Senator	State	Party	Energy Pac Contributions	1992 Energy Votes
84	Biden	DE	D	$14,750	-++
85	Sanford	NC	D	$14,000	-+-
86	Cohen	ME	R	$12,000	+-+
87	Metzenbaum	OH	D	$ 9,605	+++
88	Bryan	NV	D	$ 9,400	+++
89	Dodd	CT	D	$ 9,000	++-
90	Sarbanes	MD	D	$ 7,000	+++
91	Rudman	NH	R	$ 5,950	+--
92	Adams	WA	D	$ 5,000	+++
93	Lieberman	CT	D	$ 2,500	+++
94	Boren	OK	D	$ 2,500	--+
95	Kennedy	MA	D	$ 1,000	+++
96	Wellstone	MN	D	$ 500	+++
97	Kohl	WI	D	$ -0-	+++
98	Kerry	MA	D	$ -150	+++

PAC data unavailable for two senators having no comparable six-year fund raising period--one from each party. The 98 senators for whom PAC data are available include 57 Democrats and 41 Republicans.

Note that while there is a clear party trend in the expected direction, the top two recipients are both Democrats. Bennett Johnston of Louisiana is the powerful chairman of the Senate Committee on Energy and Natural Resources, and as such is wooed by the petroleum and nuclear industries, from whom he has accepted many generous fees as a speaker at industry functions. Lloyd Bentsen of Texas was his party's vice presidential candidate in 1988 and is currently Secretary of the Treasury; obviously he also wields the kind of power that attracts generous lobbyists. Furthermore, both men are from a section of the country which consistently yields low LCV scores, and Johnston's state has gained much media attention for its propensity to attract highly polluting industries with its relaxed attitude toward pollution.

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The Good, the Bad, and the Ugly: Alberta's Environmental Education Programs

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Alberta, arguably the farthest-advanced province in Canada in the field of environmental education, has evolved an approach to environmental education that is markedly different from other areas of the world. Three of the most important areas are outlined below.

Junior High School Course in Environmental and Outdoor Education

Perhaps the most unique characteristic of EE in Alberta is a course that has concepts such as empowerment and "taking action" imbedded in the curriculum. Albertan students at the junior high school level have the option of taking a government-mandated course entitled "Environmental and Outdoor Education" that focuses on these concepts, leading students from awareness to understanding to action. For a change, subjects like math and science are infused into this course-not the other way round! This popular course offers an exciting model for other provinces, states, and countries to follow.

Global Education

Another made-in-Canada initiative that seems to have flourished in Alberta is the Global Education Project. Sponsored by the federal government, these Projects-found in most provinces across Canada-seek to broaden the scope of EE to other interrelated education topics such as human rights, development, and conflict resolution. Environmental educators in Alberta who yearn to teach in a more holistic manner, perhaps reaching beyond the topic of environment to other interconnected topics, can access the acclaimed Alberta Global Education Project.

Summer Institute In-services for Teachers

Lacking any state-mandated pre-service EE requirements, Alberta's universities-all three of which offer a teaching degree-fall short of providing truly comprehensive teacher training in environmental education. Instead, a rich variety of workshops and in-services by a number of agencies are available to Alberta educators. Further, a rich variety of summer institutes (seven- to ten-day intensive courses that take place during the summer) are offered by organizations such as FEESA, the Alberta Global Education Project, and the Alberta Science Foundation to teachers who wish to immerse themselves in learning about some aspects of environmental education.

Lastly, the Environmental and Outdoor Education Council offers a quarterly journal entitled ***Connections***, as well as an annual conference for teachers and others. The 1994 conference, scheduled for April 14-17, is expected to attract over 200 educators from western Canada and beyond.

For more information on any of the above, contact:

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Workshop--Teaching About Population and Its Environmental Impact

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Introduction

This year, the Earth's population surpassed 5.5 billion and continues to grow by 90 million annually. As human numbers increase, the impact of human activity on our natural world intensifies, creating environmental and social dilemmas, and compromising the quality of life for all species. It is imperative that human population issues be an integral part of any environmental education curricula at schools and nonformal educational sites, such as nature centers, science museums, zoos and aquaria.

Population and the Environment

Because the Earth is a finite system, the exponential growth of human numbers cannot continue indefinitely. Every environment has a carrying capacity--the point at which there are not enough natural resources to support any more members of a given species. Growing environmental problems and resource depletion suggest that humans are dangerously close to exceeding the Earth's carrying capacity. Only a small fraction (1/32) of all the land in the world is arable. The rest has been built up into cities and towns or is inhospitable to growing crops. While the number of people continues to grow, the small portion of land which must support these people remains the same, or shrinks as cities expand. Already, one billion people (about one-fifth of the world's population) suffer from malnutrition due to the lack of adequate food supplies.

The size of the human population affects virtually every environmental condition facing our planet. As our population grows, demands for resources increase, adding to pollution and waste. More energy is used, escalating the problems of global warming, oil spills and nuclear waste. More land is required for agriculture, leading to deforestation and soil erosion. More homes, factories and roads must be built, occupying the habitat of other species which share the planet, leading increasingly to their extinction. Simply put, the more people inhabiting our finite planet, the greater stress on its resources.

Implementing Population Education

As the next generation of global citizens, leaders, consumers and voters, young people need to be prepared for challenges that lie ahead. Recently, the National Association of Biology Teachers adopted a strong population policy, urging educators to teach about "the effect of worldwide population on the environment." But how can you take a subject as abstract as human population growth and make it concrete and approachable to students? How can you discuss the impacts of rapid population growth and role of each student in addressing the problem without becoming embroiled in controversy? There are three basic guidelines for successful population education:

1. Use hands-on activities that make the abstract concrete and get students actively involved in the learning process. Simulations, games, and group exercises involving problem solving and decision making are excellent techniques for population education.

2. Encourage the expression and consideration of different points of view. Population and environmental issues are often very complex, and students can be helped to think them through and come to their own conclusions when a variety of viewpoints are presented.

3. Make students aware that something can be done about population and environmental problems, even when they seem like awfully big problems. Discuss concrete things every individual can do toward the solutions.

Here are some examples of useful hands-on population education activities demonstrated in the workshop to use with students:

Stork and Grim Reaper demonstrates the carrying capacity of a finite planet. The "stork," with a large cup, and "grim reaper," with a small cup, alternately add and subtract colored water (population) to and from a clear bowl (our planet) until it overflows.

Everything is Connected has students building a word web or "concept map." To better appreciate the cause and effect relationships in ecology, the facilitator writes the concept "More People" in the center of the board and invites students to offer environmental, economic, social and political consequences of "more people" and build a web connecting these concepts.

Food for Thought has students "populating" six world regions outlined on the floor with different colored yarn. They review regional demographic data and distribute themselves in "urban" and "agricultural" populations, the latter confining themselves to "arable" land if possible. Then they receive concrete symbols representing their regions' energy consumption (empty matchbooks), protein (peanuts), and wealth (Hershey's chocolate kisses), and respond to the inequities as they see fit. Often the results are demands for foreign aid, revolts against regional leaders, illegal immigration, or even war. After the simulation, the facilitator leads a group discussion of what happened and what it means for an American in today's world.

Take a Stand encourages students to discuss and consider different points of view on complex environmental and social issues. Signs reading STRONGLY AGREE, AGREE, ?, DISAGREE and STRONGLY DISAGREE are taped along the length of a wall, and students are directed to stand under a sign of their choice in response to statements that are read aloud. They must be prepared to explain why they are taking the particular stands they choose. Of course, the facilitator should stress that all opinions are valid, and that everyone can learn from each other when the opinions discussed are diverse. The read-aloud statements that work best in this activity are those that are a bit too black-and-white. Some examples: "In a real crunch, jobs are more important than the environment" or "There is no problem that science and technology can't solve."

When conducting a session for teachers, students or the general public related to overpopulation, it is important to conclude with a discussion of solutions, since the problem may otherwise seem hopelessly overwhelming. There are many ways that each individual can contribute to a balance of population, resources, and the environment. Treading lightly on the planet includes conserving natural resources, reducing waste and considering the global family when planning the size of our own families.

ZPG Teacher Training Workshops

The emphasis of ZPG's Population Education Program is in training educators to use innovative, hands-on activities for population education with their students. This enables more students to be exposed to population topics each year in the K-12 classroom and in nonformal educational settings.

In a ZPG teacher training workshops, educators are first provided with background information on global and U.S. population trends and their environmental and social impacts. This six-minute, prize-winning video, "World Population" is shown, which dramatically illustrates the history of world population growth. Participants then engage in a series of hands-on activities, like those described above, designed to teach students about population growth. In addition to teaching the basics of population dynamics, ZPG's activities explore resource distribution, energy use, carrying capacity, interdependence in nature and responsible citizenship.

ZPG's activities are designed to be value-neutral. Although ZPG as an organization has a specific agenda to promote, the Population Education Program strives to present balanced views in the materials. As with any topic, students are more likely to remember their instruction if they process the information themselves. Through the information and activities, students can use critical thinking skills to draw their own conclusions on the issues presented.

Since ZPG has produced six teaching kits for different grade levels and subject areas, workshop agendas can be geared toward a particular audience. For the NAAEE session, an agenda was developed which includes a variety of environmental education activities for grades K-12. Workshop participants receive complimentary teaching materials to support their population education efforts: current population statistics, scripts for classroom activities, resource lists and reference guides. They also receive follow-up assistance through a quarterly newsletter.

When the Gulf is Your Backyard--Programs That Teach About Marine and Coastal Issues

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Situation

Escambia and Santa Rosa counties, like the rest of Florida, are experiencing a tremendous growth rate. Santa Rosa county's population was 56,000 in 1980. It rose to 82,000 in 1990, a 45.8% increase. The state of Florida's 13 million residents can expect 4 million new neighbors by the year 2000. We also have an ever-increasing tourist influx-35 million people visit Florida each year. Without question, most people come to Florida for her water. Seventy-five percent (75%) of our population live within 5 miles of a coast. Visitors are attracted to our sugar-white beaches and varied water recreation. One out of every six Florida families has a boat!

New and old residents, alike, must learn to manage resources in order to maintain the high quality of life which attracted them to Florida, and to protect the Gulf coast that they have made their home. The year 1992 to 1993 was designated by the Environmental Protection Agency and by the President as "The Year of the Gulf". This designation helped to highlight the problems and issues we are concerned with along the Gulf of Mexico and to help the five Gulf coast states work together.

Lindbergh Educator Workshops

Made possible by a grant from the Charles Lindbergh Fund, the "4-H Capture the Bay" program was comprised of a series of intensive workshops for teachers, extension agents, and 4-H leaders and their students/youth groups in marine and coastal concepts and issues, and in leadership. We were one of 7 out of 259 applicants to receive a 1992 Lindbergh grant, the only recipient involved in education instead of research. Many teachers submitted proposals in teams of two or three. It was refreshing to see this teamwork. We know that it is successful in the schools and in 4-H clubs. We had an excellent mix of formal and nonformal educators, those who work with younger and older youth, males and females, minority representation, and representation from Florida, Alabama, and Mississippi.

Funds from the Lindbergh grant were used to send all of the educators and their young people to the workshops for free. Funds were also used to buy equipment and supplies like aquariums, pumps, microscopes, and specific gravity meters to update the marine lab at Camp Timpoochee. The educators workshop turned out to be the weekend of the March snowstorm, the "storm of the century", but our determined participants canoed in the snow, and seined in the bay with air temperatures of 22 degrees and winds of 35 mph.

During the Student Weekends of the Lindbergh Educator Workshops teachers returned with their students, and helped to facilitate as the young people went through a similar program. The weather was much more cooperative for these. Over 160 people participated in the Lindbergh Educator Workshops. Adult participants in the Lindbergh Workshops went on to serve as volunteer leaders in the Marine Institutes. Their classes or 4-H clubs adopted sea turtle nests through our Turtle Watch program, adopted stretches of beach through our Adopt-A-Shore program, and volunteered to collect fishing line for recycling. Many young people who participated in the Lindbergh Workshops returned as participants in the Marine Institutes and volunteered in the September Coastal Cleanup.

Manatee Awareness and Conservation

This was my 5th year to coordinate the three **Manatee Dive Trips**. This year we led the annual 4-H/ Youth Manatee Dive Trip, the Adult Educators Manatee Dive Trip, and a Special Group Manatee Dive. Our Special Group Dive was offered for young people from the Pensacola projects PREP program. Expenses for these minority students were covered by a federal grant through the University of West Florida.

About 250 people participated in the manatee dive trips this year. Over 1,400 people have participated in these manatee dives since I began leading them for the marine extension program in 1989. I have led 19 manatee dive trips and presented 60 programs on manatees since I have been in this position. I have had over 25 news articles and stories about the Manatee Awareness and Conservation program.

This has resulted in a broad understanding and appreciation of Florida's state marine mammal. Many participants have purchased manatee car plates, adopted a manatee through the Save the Manatee Club, written their legislators to encourage manatee legislation, enforcement of manatee protection laws, and increased manatee sanctuary areas. Participants have gone on to organize their own manatee dive trips. They have supported a U.S. Postal manatee stamp, manatee diver certification, and regulation of the Crystal River National Wildlife Refuge. They have become safer boaters and better divers. They are more concerned about the issues of diminishing sea grass beds, increasing marine debris, and increasing numbers of boaters in Florida.

Adopt-A-Shore Program

Through our local Adopt-A-Shore programs families, schools, churches, organizations, and other groups adopt a one-mile stretch of beach. and commit to cleaning it at least three times a year. One of those times would be during our annual Coastal Cleanup in September. During the **Coastal Cleanup** in our two-county area, 660 volunteers collected 12,380 pounds of marine and coastal trash and 9 miles of fishing line from 73 miles of shoreline in a one-day cleanup. But in Escambia and Santa Rosa counties we now have a **Rivers Cleanup**, an **Estuary Cleanup**, and several **Underwater Cleanups** each year as well. In the Underwater Cleanups, certified SCUBA divers clean under fishing piers and bridges. The divers bring up armloads of fishing line, nets, crab traps, bottles and cans.

This program has expanded into more than just a beach cleanup, and more than just a Fall activity. We received a grant from Keep Florida Beautiful to fund our local Adopt-A-Shore program and our annual Coastal Cleanups. Our Adopt-A-Shore program now includes adopted stretches of beaches, estuaries, and rivers. Over 70 groups have adopted over 95 miles of coast in Escambia and Santa Rosa counties, and that number grows each day. We have adopting groups cleaning their stretches of beach as often as once a week throughout the year. We now recycle during our cleanups and process the hazardous materials that are found. We ship all of the fishing line to Berkley to be recycled. We report all of our results (including number of volunteers, pounds of debris collected, pounds of recyclables collected, pounds of fishing line collected, unusual items found, sources of debris, and entangled or injured wildlife) to Center for Marine Conservation, Keep Florida Beautiful, and the Gulf of Mexico Program.

In this workshop, we covered safety, importance of data collection, and how to respond to stranded or injured wildlife. We introduce adopters to new programs like the Adopt-A-Shore Rivers Project and the Citizen Water Quality Monitoring Program, so they can become even more involved.

Other Programs

We offered two-day **Mini Marine Camps** for Special Education elementary students. Our groups included young people with Cerebral Palsy, heart conditions, liver disorders, mental retardation, and learning disabilities. The Mini Marine Camps are condensed versions of our week-long Marine Institutes held in the summer. The **Junior 4-H Marine Institute**, for 8 to 13 year olds, and the **Senior 4-H Marine Institute**, for 13 to 18 year olds, each offer opportunities for young people and their adult volunteer leaders to canoe, snorkel, seine and castnet, work in the marine lab, tour a seafood market, tour a seaquarium, fish, go on a Moonlight Bay Walk, and participate in Challenge Adventure ropes activities.

I worked with a marine biology teacher to offer four-day **Sailing Excursions** for at-risk high school students. On these excursions, students kept 3-hour watches around the clock, prepared all their own meals, did a beach cleanup on a barrier island, and took water samples in bays and in the Gulf. At night, they studied astronomy. During the day, they did marine mammal surveys and learned sailing techniques.

The **When the Gulf is Your Backyard** series is a series of workshops targeted toward waterfront residents and property owners in coastal communities. Participants learn about hurricanes, rip tides, coastal development, salt tolerant plants, wise use of fertilizers and pesticides, and water conservation. They learn how to avoid sting rays, jellyfish, and sunburn, and how to get more involved by adopting a stretch of beach or baby-sitting a sea turtle nest. This is essential information for people who want to live on the coast.

Developing a Coalition for Environmental Issues Education

Michelle Youngquist
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The Keystone Science School (Keystone, Colorado) was established in 1976 as part of The Keystone Center, a non-profit organization. We offer residential field science programs to students of all ages. With our campus located in the heart of Colorado's Rocky Mountains, our "classroom" consists of the montane, subalpine, and alpine ecosystems which surround us.

School groups, primarily middle-school ages, comprise the largest number of our participants. The students spend from 2 to 10 days living at the Science School and exploring a variety of content areas spanning life, earth, and physical sciences.

We also conduct programs for adults, which include Elderhostel programs (for students 60 and over), weekend ecology workshops (primarily attended by K-12 classroom teachers), and Summer Teacher Institutes.

The KEY ISSUES SUMMER INSTITUTE: "Bringing Environmental Issues to the Classroom," developed in 1991, is aimed at middle school teachers of all disciplines. The program centers on training teachers to facilitate their students' balanced investigation of environmental issues. Process is emphasized over specific content about environmental issues.

During the Institute, participant teachers are provided with a generic framework to use in investigating any environmental issue. They practice using it both on an issue which is local to the Keystone Science School, and on an issue of more local concern to them personally.

Instructional elements of the program include defining terms, brainstorming and categorizing environmental issues, concept mapping, valuing exercises, activities concerning risk perception and communication, team-building and communication activities, sessions on public policy and the societal context of environmental issues, instruction in a SEPUP (Science Education for Public Understanding Program of the Lawrence Hall of Science, Berkeley, California) module, field trips, water quality monitoring, action-taking discussion, environmental education activities, and sharing among participants.

Keystone Science School has conducted the Institute for the past two summers with a total of 76 teacher participants. Each teacher's participation is supported by a sponsor. Most of the sponsors thus far have come from the corporate sector.

Following the 1993 programs, we are expanding the role of the sponsor from that of solely financial support, to that of an ongoing resource. Each sponsor will provide a "Resource Liaison," a person active in a field related to environmental issues. The Resource Liaison will, among other things, be available to act as a coach, a resource, an expert from the field, a colleague, a contact, and a co-instructor.

This relationship will provide access for the teacher to the business/corporate world, and for the business/corporate-person to the world of teachers and students. Doors will be open for communication and mutual learning. It is hoped that as this partnership grows, all involved will have a more informed outlook on the issues of concern to all of us.

STRAND II: CURRICULUM AND TEACHING STRATEGIES

Ecosystem Management--Fundamental to Survival

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Thirty states have formal environmental education programs or mandates for their development. Most mandates require individual districts to adopt and integrate environmental topics into the curriculum. Teachers are often inundated with glossy prints of brown eyed, furry, endangered species, thought provoking ready made lesson plans, file boxes of attractive enrichment activities and powerful eye catching posters of environmental atrocities all of which are conveniently keyed to essential element objectives. There is, however, a problem that exits with thematic regularity! Much of the environmental "information" that is directed at children is conflicting, sensational in nature, mass marketed, poorly researched, poorly written, lacking scientific foundation, written by people unfamiliar with children, and often little more than propaganda.

The elementary school educator lacking the time and the expertise to sift through the mountains of materials and often under pressure from administrators to incorporate environmental topics into existing curriculums are forced to create programs using a patchwork of published materials. Although quality programs are available, many present fear eliciting messages, calls for political activism, distrust for technology, and indoctrination in pre-determined eco-values.

Mike Weilbacher a supporter of environmental education and former *PAEE* newsletter editor wrote in a current article in *E magazine* "Activists simply don't make good educators, no matter what the cause, for the agenda of an activist is to promulgate propaganda" (Weilbacher, 1993).

However well intentioned, the Apocalyptic approach to "educating" children has the potential of creating a generation of numb, despondent individuals that lack in adequate knowledge and drive to seek solutions to actual non-contrived environmental problems. Our intentions as educators should be to provide our students with the tools necessary to ask questions and make informed decisions in an effort to make positive contributions to the dilemmas that face mankind and the planet.

Today, children are being inundated with pseudo facts, predictions of gloom and guidelines for accurate eco-living that can do little more than retard the inevitable demise of the Earth. There is no escaping the barrage of messages made by quasi environmental specialists. Formats for the messages come often in harmless packaging like the Sunday comics, as Calvin reflects on the thoughtless actions of man and the Earth being something taken for granted (Watterson, 1993). The strip Hi & Lois laments as to the increasing size of the hole in the ozone, which hovers ominously over North America and questions if indeed Chicken Little was on target all along (Walker, 1993). Students are encouraged by well meaning educators to write letters to senators and representatives, raise money to support eco-programs, buy rain forest nuts, adopt a whale, and purchase an acre of rain forest for $37.50 in a nature preserve (Hair, 1993). Magazines such as *Newsweek* in a recent issue present the top ten environmental challenges complete with activities, eco-puzzles and interviews with Al Gore. Trade books, conservation newsletters, club memberships, as well as videos aired as prime time entertainment are included in the list of potential platforms for dissemination of eco messages. As so eloquently stated in the popular Wendy's advertisement "where's the beef?" where's the education?

Educators, like all U.S. citizenry, are concerned with the state of the planet, its rain forests, endangered species, water and air quality. However, we cannot allow ourselves to go off on environmental tangents, forgetting our quest for higher levels of thinking, problem solving and scientific soundness. We as educators must seek out the best, most accurate programs having been thoroughly researched, resisting extremists' messages proposing personal agendas.

The program Ecosystem Management, Fundamental to Survival is presently being developed in an effort to address some of the problems found in environmental education programs. The program is designed to target kindergarten through third grade children. This area was selected because of a recognized absence of quality programs for this age group, and research indicating that value setting concerning natural resources begins at a very early age (Engleson, 1985).

The module is designed to be interdisciplinary, multi-sensory, interactive, developmentally appropriate, based on children's unique interests, and is scientifically based. Package components will include teacher and student videos, manipulatives, visuals, trade books, auditory tapes, and teacher guides. Teacher guides will include species histories, lesson plans in math, science, language arts, and fine arts. Activities will be formatted for self guided, teacher directed and learning center experiences. Also included in the teacher guides will be a listing of suppliers and participant surveys for continued program evaluation. The authors feel the concept that environmental problems are solvable and that humans have the primary role in determining the direction of the resolution. Basic ecological concepts critical to ecosystem management including community, habitat, niche, prey/predator relationships, trophic levels, succession and extinction are addressed preparatory to the concept of holistic ecosystem management. Management concepts and issues introduced include: domestic and wild animals, endangered species, human impacts, and manipulation of communities to produce desired results.

To teach such concepts the eastern wild turkey, *Meleagris gallopavo silvestris*, has been chosen as the introductory species. It represents a management success story, having historical significance, and is a species with which young children identify well.

This program does not propose itself to be the cure for the ills of environmental education. However, it can boast movement in a positive direction by sending the message to today's youth to be critical thinkers, seeking personal knowledge, asking questions, testing answers, reasoning and making informed decisions. Ecosystem Management, Fundamental to Survival emphasizes learning as an interactive process as supported by the National Association of Young Children (NAEYC). While providing scientifically sound conservation education (Bredekamp, 1992).

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Path Analysis Study of the Awareness to Action Model for Environmental Education

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Introduction

Environmental education curriculum is based on the notion that the interconnections among academic disciplines and pedagogy must be bridged to enhance the potential for developing environmentally literate individuals. Environmentally literate individuals (ELI): a) command cognitive/affective knowledge about biophysical interactions, b) possess political know-how (Bogan & Phillips, 1989), and c) are willing to engage in responsible environmental behaviors (Hines, 1987). Since time immemorial, traditional reformers have been seduced by the notion that all humankind needed was khowledge and humankind would mend its ways. However, the ELI might: 1) ask what motivation can be identified which would appeal to the most base of humankind's behaviors, 2) implement that motivation and 3) watch as members of the species "beat a path to the environmentalist door." Therefore, cognitive, attitudinal and behavioral components were incorporated into the development of the Florida Environmental Literacy Survey (FELS), a pen and paper instrument.

The FELS is designed to ascertain the environmental understandings possessed by Florida's high school students. The design and construction of the FELS is based on the content and processes of the science/social science awareness to action (ATA) model for environmental education. The FELS measures bioecological knowledge, general environmental attitudes, perceptions of and participation in environmentally sound practices, and knowledge of political action strategies.

Purpose

The purpose of this study was to evaluate the tenability of the ATA curriculum model of environmental education using the FELS.

Procedure

The FELS was administered to 369 exiting high school seniors from two school districts in central Florida. Data were evaluated with exposed to correlational and path analysis statistical procedures. Zero-order correlations were unimpressive to moderate, ranging from $r=.12$, $p<.05$ to, $r=.60$, $p<.01$. Interpretation of correlational analysis indicated that students: a) demonstrated limited knowledge of the interactions in the biophysical environment (KAS), b) had a positive ecological attitude (ATT) and c) appeared to be unskilled at using political action strategies (PAR). Although students tended to value necessary environmental behaviors (NEB), self-report indicated that there was little participation therein (AEB) [for a more in-depth study see manuscripts currently under review].

Path Analysis

Path analysis (reported as B-coefficient) is a dimension of correlational statistics that augments the interpretability of the zero-order correlations by differentiating direct and mediated effects among variables. Path analysis can be used to discover the viability of curriculum models by elucidating the relations among components therein (Kromery, personal communication, 1992).

A path analysis provides a systematic means of relating assumed causal associations (knowledge--> attitude--> behavior). These associations are related by determining direct and indirect relationships among these variables (Hines, Kromery, Burick, Swarzman, Mann, & Homan, 1986; Pedhazur, 1982).

The direct effect (DE) of one variable on another is that effect which is not mediated through other variables. For a causal variable there exists a path coefficient indicating an amount of expected change in an outcome variable as a result of one standard deviation of change in the causal variable, called the direct effect. An indirect effect (IE) is that part of the effect of the causal variable that is mediated through other variables. The total effect is the sum of the direct effect and the indirect effect(s) on an outcome variable.

Path analysis can be applied to causal models based on knowledge and theory. Path analysis was used to investigate the extent to which the components of the ATA model of environmental education serve as mediators in developing personal and political action.

The path model characterizes the relationships between the biophysical knowledge/ecological attitude variables and the outcome variables which involve active participation. Figure 1 shows a modified path model for the ATA theory based model, upon which the Florida Environmental Literacy Survey was constructed. Zero-order correlations are indicated by parentheses; path coefficients are listed above (standard partial regression coefficients) and denote direct effects.

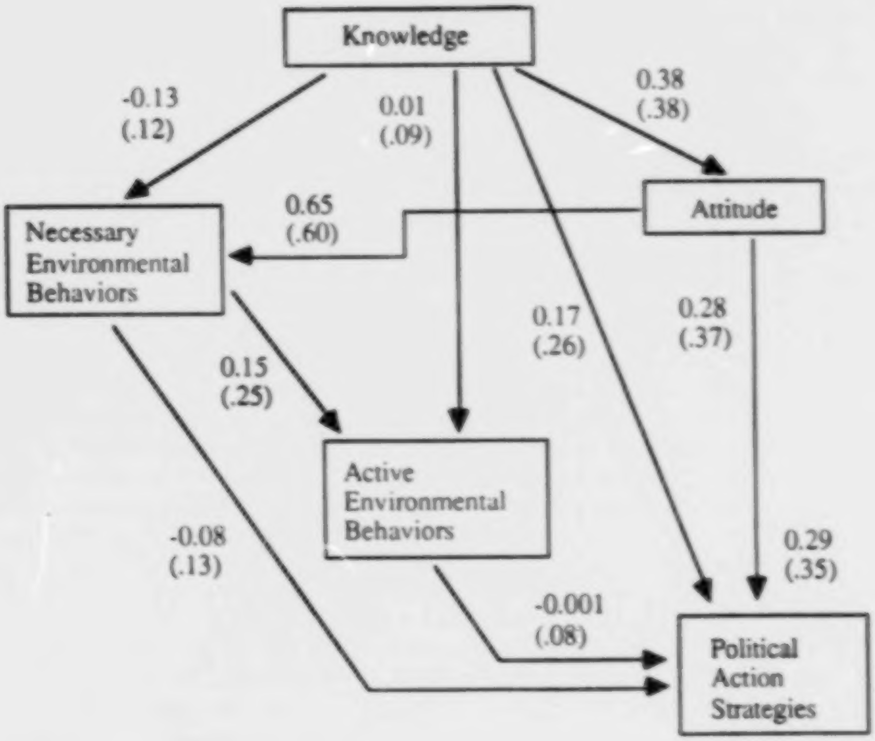
Knowledge
-0.13
(.12)
0.01
(.09)
0.38
(.38)
Attitude
0.65
(.60)
Necessary Environmental Behaviors
0.17
(.26)
0.28
(.37)
0.15
(.25)
Active Environmental Behaviors
-0.08
(.13)
0.29
(.35)
-0.001
(.08)
Political Action Strategies

Figure 1

Path Model Relating Knowledge, Ecological Attitude, Perception of Necessary Environmental Behaviors, Participation in Necessary Environmental Behaviors and Political Action Strategies.

The Zero-order correlation observed between KAS and NEB was .12. Decomposition of this correlation shows a direct negative effect of the KAS measure on NEB (B=-0.13). However the indirect effect of KAS through the ATT measure yields a path coefficient of 0.25 (multiply KAS/ATT X ATT/NEB). The total effect (add DE + IE) equals 0.12. Thus, the observed correlation between biophysical knowledge and valuing necessary environmental behavior is in part mediated through the development of ecological attitudes (Table 1).

Table 1
A Decomposition of Zero-Order Correlations of Knowledge and Ecological Attitude with Necessary Environmental Behavior

Variables	Zero-Order Correlations	Direct	
		Direct	Indirect
Knowledge	.12**	-0.13	0.25
Attitude	.60*	0.65	None

Note: *p<.01; **p<.05.

The correlation between active environmental and attitude is r=.26, p<.01. Decomposition of this correlation shows a direct effect of the ecological attitude measure on active environmental behaviors (B=0.17). That is to say, for every standard deviation increase in the ATT measure, one would expect to see a 0.17 standard deviation increase in the self-report of AEB. In addition, the indirect effect of ATT on AEB is mediated through valuing NEB (B=0.10). The direct effect of NEB on AEB yields a path coefficient of, B=0.15. These data support the notion that participating in "environmentally sound behaviors" is mediated through attitude and valuing those behaviors (Table 2).

Table 2
A Decomposition of Zero-Order Correlations of Knowledge and Ecological Attitude and Necessary Environmental Behaviors with Active Environmental Behaviors

Variables	Zero-Order Correlations	Direct	
		Direct	Indirect
Knowledge	.09	0.01	-0.01
Attitude	.25*	0.17	0.10
Necessary Behaviors	.25*	0.15	None

Note: *p<.01; **p<.05.

Further, knowledge of political actions strategies is mediated through ecological attitude. There is a direct effect of ATT on AEB.

Conclusion

Path coefficients were generated for the components of the ATA model of environmental education using the data collected for the Florida Environmental Literacy Survey. Conclusions that can be derived from an analysis of the path coefficients are: a) attitudes connect biophysical knowledge with valuing necessary environmental behaviors, b) attitudes influence participation therein, c) attitudes connect necessary environmental behaviors with active environmental behaviors d) there is a direct effect of valuing necessary environmental behaviors on participation therein, e) a linkage exists between biophysical knowledge and knowing political action strategies; attitudes and political action strategies.

The ATA model for environmental education is based on the notion that the person most likely to bring about political action for environmental protection in a participatory democracy: a) understands biophysical interactions, b) wishes to seek a sustainable planet and c) knows how to interact with the government. It should be noted that ecological attitude is a central mediator between the components of the model and is in part the key to personal and political action. The interconnectedness of the components of the model is shown by the following paths: a) KAS--> ATT--> PAR, b) KAS--> AEB--> PAR, c) KAS--> NEB--> PAR, d) ATT--> AEB--> PAR, e) ATT--> NEB--> PAR, and f) NEB--> AEB--> PAR.

The path analysis suggests the plausibility of the ATA model for environmental education curriculum design as supported by the data collected in this study.

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Interpreting a Rainforest Ecosystem (When Your Facility Doesn't Have One)

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Introduction

Through the popular media, the public is generally aware of the plight of the world's rainforests. Until an individual has the opportunity to experience a rainforest, the uniqueness of this ecosystem and the crisis it faces will not be fully appreciated. Unhappily, most visitors to an interpretive site or nature center will never have the opportunity to visit and study the forests bordering the equator. The next best thing is a trip to the woodlands at your local nature center. A skilled interpreter, aided by hands-on materials and props, and blessed with the cooperation of the weather, can provide visitors to northern latitude nature centers with an almost realistic rainforest experience.

Picture This

Visitors meet at your facility at 2 p.m. on a hot, humid, August afternoon. The disturbed forest edge, where your group is now assembled, can be likened to a jungle. You are dressed in your tan field clothes with long sleeves rolled down and pants tucked into your socks. A bandanna and binoculars hang around your neck. You reach into your pack for insect repellent and apply it while instructing your audience to do the same. You warn them not to sit down without looking to see if there are biting ants in the vicinity; not to grab onto a branch or vine without looking first to see if it has thorns or is home to a testy critter. Snakes are not to be approached until an identification is made. You then bushwhack through the jungle and enter the forest interior--your rainforest.

Their Imagination Goes to Work

Massive grape vines become lianas. Exposed roots and rocks remind you to talk about the shallow rainforest soil. The largest trees are the emergent layer of the rainforest. Below that is the canopy, understory, and forest floor, each with its own microclimate and set of inhabitants. A fallen "wolf tree" creates a gap in the forest canopy and an opportunity for rainforest ecologists to study up close the life that ordinarily would be at the top. While walking along, you hand out trail mix made from rainforest products: dried papaya and pineapple slices, banana chips, chocolate bits, coconut, peanuts, and Brazil and cashew nuts.

In preparation for your field trip, you placed a potted bromeliad from the local nursery in a crotch of a tree and stocked it with a replica poison arrow frog. What other life might be found in a bromeliad? How does it get its food and water? How are epiphytes of the rainforest similar to lichens? Do you see an orchid? The roll of thunder reminds you to talk about the water cycle. Speaking of which, a leaf borrowed from a rubber plant provides the opportunity to talk about drip tips. You pull from your pack an aerial root cut from a large *Philodendron* to illustrate one method of water absorption. A large leaf from the same plant is a sun grabber. A mushroom found on the forest floor is an important decomposer. Look around you to find other decomposers. Slippery bark, spines and thorns, distasteful leaves, and chemicals are defense strategies employed by plants in the rainforest. Can you see some examples here, too?

Empty your pack of nuts and spices obtained from the grocery store. What parts of tropical plants do they come from? Pull out your collection of rainforest pharmaceuticals, resins, oils, wood samples, perfumes, latex, gums, essential oils, fruits, vegetables, and flavorings. How many items in your home have their roots in the rainforest?

Where are the animals? Most rainforest animals are canopy critters, well camouflaged, or active at night. Prior to your trip, you strategically placed plastic laminated, life size, full color cutouts of rainforest animals, birds, and insects in appropriate locations along the trail route. Serendipitous sightings of these critters excite participants and offer a major interpretive opportunity for the trail leader. How do rainforest animals communicate? Listen to the dog days chorus of our woodland cicadas. For added effect turn on a cassette tape of rainforest sounds. Look for animal homes--what tropical animals might live in tree dens? Look at the forest layers. How many niches can you identify? Do you see any insect pollinators? Pull out a carpenter ant in a bug box and imagine it is a leaf-cutting ant or talk about termites.

As you walk along, talk about global warming, loss of habitat and biological diversity, illegal trade in tropical pets and products, medical potential of tropical plants, undiscovered species, and over-consumption of rainforest resources. Discuss the problems caused by overpopulation, cattle ranching, slash and burn agriculture, hydro-electric projects, and commercial logging. Summarize by brain-storming ideas. What can we all do to save tropical rainforests and the plants and animals that live there? If your walk is timed just right, it will now start to rain!

Back to Reality

You dash into your nature center facility where you have a rainforest exhibit in place, and resources and handouts to share. It's back to the real world now, but the message of the rainforest will linger long in the minds of the participants.

Using the Outdoors to Teach Experiential Science (UTOTES)

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The North Carolina State Museum of Natural Sciences was founded in 1879 as North Carolina's first state-supported museum. The purpose of the Museum is to enhance the public's understanding and appreciation of the natural environment in ways that emphasize the biodiversity of North Carolina and the southeastern United States and relate the region to the natural world as a whole. Every year the Museum receives close to a quarter of a million visitors, of whom more than 100,000 are school children, reflecting the Museum's commitment to public education. The Museum also conducts outreach programs for schools, as well as field study and other in-service training for teachers. Using the Outdoors to Teach Experiential Science (UTOTES) is an exciting, innovative teacher program that has grown out of more than a decade of these museum teacher workshops.

UTOTES brings hands-on science center stage in the elementary classroom and seeks to reach the entire faculty of a school, thereby laying the basis for systemic reform. The program combines site-based workshops and summer field training for teachers with the creation of a natural, living laboratory at each participating school. Developed cooperatively with the North Carolina Science and Mathematics Alliance and the North Carolina State Department of Public Instruction, UTOTES has already been successfully piloted in 21 elementary schools across North Carolina and is currently being brought to 10 additional sites. The Museum has also applied to the National Science Foundation to extend the program to 72 additional schools in the state.

Need for UTOTES

Educational researchers have documented that teachers-particularly at the elementary school level-lack basic information about handling, using and maintaining plants and animals. They have confirmed that a majority of elementary teachers lack the confidence to develop meaningful lessons beyond those provided in basic textbooks.

Educational research has also demonstrated that the teaching of scientific concepts cannot wait until secondary school. A 1977 study commissioned by the U.S. Forest Service advocated expanded environmental education in the lower grades, asserting that children have their deepest and most extensive relationships with the outdoors between the ages of eight and twelve. Other studies have confirmed that environmental attitudes carried into adulthood-both positive and negative-are formed well before students reach high school.

UTOTES Project Objectives

UTOTES seeks to accomplish the following objectives:

1. Improve participating teacher attitudes toward the teaching of science.
2. Increase the amount of time devoted to science in participating elementary schools.
3. Institutionalize school-based and community-supported use of school grounds as a living laboratory for improved science instruction.
4. Increase student interest and improve student achievement in science.

UTOTES Project Activities

The UTOTES program requires that 16-24 representatives from each school participate in six sessions of site-based training. While composed primarily of teachers, the group should include the principal and one or more parents or community supporters. The presence of the principal and active community members is vital to ensuring continued endorsement and resources for the program once museum staff are no longer directly involved. Altogether, 25 hours of on-site training are provided, covering the following topics:

- Assessing the school grounds for potential outdoor classroom opportunities (e.g., locating ecological features such as waterways, wetlands, potential butterfly garden sites)
- Conducting a school grounds plant and animal inventory and developing student learning activities using these natural resources
- Developing plans for school-wide projects, such as building bluebird or bat boxes
- Developing strategies for bringing the outdoors inside the classroom, such as maintaining live animals in the classroom, setting up bird feeders outside classroom windows for bird behavior studies, and establishing a "rotten log box" in the classroom to study decomposition
- Developing projects involving wildlife plantings to enhance the wildlife habitat potential of the school grounds
- Creating and maintaining a butterfly garden
- Project evaluation

In each case, training is practical and immediately put into practice. During or between sessions, teachers will translate what they've learned into teaching resources and lessons. By the end of the training, UTOTES participants and their students will have created beautiful and practical outdoor teaching labs on their school grounds.

A lead teacher from each school is also required to attend a Summer Field Institute. This Institute equips this teacher to become a site-based lead teacher for ongoing UTOTES implementation. Held during the summer immediately following the UTOTES implementation year, the 30-hour workshop, coordinated out of the Museum, takes teachers "on the road." Through the "mobile" institute, teachers gain a broader understanding of how the ecological relationships that can be seen on their school grounds related to broader ecological systems in North Carolina. Teachers visit schools that have successfully implemented outdoor education programs and tour public botanical and butterfly gardens. All UTOTES teachers are eligible to receive Continuing Education Credits for their participation.

Evaluation

Evaluation of UTOTES is ongoing and multi-faceted. With assistance from the North Carolina Science and Mathematics Alliance and the North Carolina State Department of Public Instruction, on-site evaluations are being conducted. These include assessing program impact on teacher and student attitudes towards experiential science using pre- and post-program surveys. School principals and lead teachers also play a key role in on-site evaluation through structured classroom observations. Student achievement will be measured by examination of scores on state-administered end-of-year science tests. Teachers also make self-reports on changes they believe are attributed to participation in UTOTES.

Continuation Planning

We envision UTOTES continuing to expand. We believe this program will become a model for establishing effective outdoor education programs statewide. Within each school, once established, UTOTES is self-perpetuating. We are currently seeking National Science Foundation funding to support materials development, computer networking among UTOTES teachers in different schools, and a state conference all aimed at sustaining UTOTES momentum and enriching existing and future programs.

Collaborative Inservice to Promote Activity-Based Environmental Education Through Partnerships

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Partnering for Elementary Environmental Science is a long-term program designed to improve the teaching of environmental science from kindergarten through sixth grade by building partnerships between schools and resource professionals from the Ohio Department of Natural Resources (ODNR). This collaborative effort is co-sponsored by ODNR, The Ohio State University at Mansfield, and the Science & Mathematics Network of Central Ohio. The Network, affiliated with the Central Ohio Regional Professional Development Center, supports reform-based partnerships which strive to challenge and change teaching and learning environments through classroom focused activities. The project is partially funded by the Ohio Board of Regents through an Eisenhower Mathematics and Science Education grant with the balance of the funding contributed by the co-sponsors.

The purpose of the project is to improve practice in elementary science education through partnerships aimed at developing teachers' knowledge of, skill in, and attitudes toward teaching environmental science through an activity-based approach. The project involves an intensive four-day summer institute (three graduate credits) with follow-up activities and course (one credit) which emphasizes understanding, planning, implementing, and evaluating a hands-on approach to instruction and partnering for environmental activities.

The objectives of the summer institute are to:

1. Increase knowledge and understanding of activity-based environmental science.
2. Increase knowledge and skills in forming partnerships and cooperative relationships with other educators.
3. Evaluate and use a variety of instructional strategies, materials and programs.
4. Examine issues concerning planning, implementation and evaluation.
5. Analyze and synthesize information on environmental science, activity-based approaches and partnering to develop models and guide practice.
6. Develop confidence in and commitment to teaching environmental science through an activity-based approach.

Objectives for the follow-up program are to:

1. Examine issues surrounding the implementation of activity-based environmental science.
2. Nurture partnerships and encourage implementation of long-term action plans.
3. Critically reflect about own practice and partnering.
4. Provide a support system for implementation and partnering.

During the 1993 summer institute, 45 teachers and 27 resource professionals from 5 rural Ohio counties participated in sessions where university faculty and the project collaborators presented and modeled instructional strategies such as management skills, collaborative learning and questioning strategies. In addition, participants were introduced to innovative curriculum materials in environmental science appropriate for elementary students.

As each topic was presented, background information was given and then carefully selected environmental education activities were used to illustrate the topic. (A complete topical outline of the institute is shown in Table 1.) For example, when presenting the topic of outdoor management, the Project WILD activity, "Turtle Hurdles," was utilized to model both the management of students and materials. While each activity was debriefed as it would be in a regular classroom setting, the major emphasis was placed on the topic being addressed in that section of the institute. Most of the activities used during the institute were taken directly from easily obtainable resources, to help the participants become familiar with the materials and give them first-hand experience in how to conduct the activities.

Curricular materials used in the institute included selections from Great Explorations in Math and Science (GEMS), Outdoor Biology Instructional Strategies (OBIS), Project Learning Tree, Project WILD, and Activities Integrating Mathematics and Science (AIMS), as well as a variety of materials available through National Science Teachers Association and other suppliers. At the close of the summer institute, each participant was given the opportunity to place a $35.00 order for resource materials to aid them in developing environmental activities that would enhance their teaching. These materials would then become the property of the participant, so as to assist them in building a personal resource library for environmental activities. The materials stipend had the added benefit of causing the participants to carefully review the many resource materials available, so they could make the best choices.

As part of the partnering program, teams of teachers and resource professionals cooperatively develop partnership action plans. The action plans describe the goals and corresponding activities that the partnership will undertake in the upcoming school year. As the school year progresses, the teams implement and assess the partnering activities and any materials developed. They share their products and findings with each other at the one-day follow-up session.

During the summer institute, key elements and examples of reform-based partnering are introduced. Jointly developing goals, collaborative planning and implementation of activities, and support from all levels of the school and agency are stressed as characteristics that will lead to lasting, more effective partnerships.

A number of planning and design elements contribute to the effectiveness of the project. The framework for the content and methodology has been based upon previous successful professional development programs conducted by the co-sponsors. The project not only balances theory and practice, but models a strategy for effective staff development (Joyce and Showers, 1988). The theory, content and skills are presented and modeled; participants actively practice the topic and receive feedback; and the learning is applied directly to collaborative activities during the school year.

From the beginning teachers and resource professionals are incorporated into the planning and development of the program objectives and activities. During the institute, collaboration and peer interaction are emphasized by modeling and by providing time for it to occur. This was particularly helpful as partner teams began to develop their goals and action plans.

As part of the program evaluation, questionnaires were administered before and after the summer institute to determine the impact that the course had on participants' knowledge of and confidence in using activity-based science instruction as well as their awareness and attitudes toward using effective partnering strategies. Additionally, a final survey will be conducted in June of 1994 to determine any changes that have occurred as a result of the year long partnering activities. Additional evaluation data for the institute were also collected through observations made by the evaluator during the workshop and through reflective journals kept by the participants.

Responses from the surveys, informal observations and feedback from the reflective journals all indicated that the Partnering for Elementary Environmental Education was an outstanding in-service that will enhance participating teachers' and resource professionals' ability and confidence to provide high quality environmental education activities through collaborative partnering relations. Analysis of pre- and post-questionnaire responses indicated gains in scores by both teachers and resource professionals across almost all questions. The following quotes echo reoccurring themes found in participants' written comments:

From teachers:

- I believe that the greatest strength of the institute had to be teachers and resource professionals sharing ideas and working together toward a common goal--increased environmental awareness and stewardship in children.
- The greatest strength of the institute was the concentrated block of time we had to initiate and develop our partnership plans.
- I feel this workshop was possibly the best I've ever attended in 15 years as a teacher. The excellence was due to equally outstanding presenters, strong organization, great variety, opportunities to process (debrief), continuation of workshop this fall, etc., etc. Thank you for a wonderful opportunity!
- I enjoyed meeting a variety of ODNR people and getting to know more about their work. I have a deeper appreciation for their careers.

From resource professionals:

- Our students, will reap many benefits from this partnership. It was exciting to work two totally different areas together.
- The workshop has connected me with two teachers in a way not possible otherwise. I will grow through students' and teachers' feedback. I have enjoyed it and expect to enjoy the partnership in the future.
- I am excited about the potential of the partnering and feel that it is a much needed component of the program I work in.

Only two major areas for improvement were identified for future similar in-services. First, better communication should be made with resource professionals prior to the institute to better establish expectations for participation. Second, the institute should be offered over a longer period of time, perhaps spread over five days instead of four, to provide more opportunities for teams to interact, reflect upon the activities, and have time for recreation.

Since one of the major objectives of the workshop is to have participants implement partnering activities, long-term program evaluations, in addition to the previously mentioned post-questionnaire and journals, will also include case studies of three partnerships.

Table 1
Summer Institute Topical Outline

- Day 1 Introduction
    - From Exposition to Inquiry
    - Sharing Perspectives
    - Journals
- Day 2 EE and Science Education
    - Process Skills
    - Introduction to Partnering
    - Child Development
    - Partnership Planning Time
    - Journals
- Day 3 Management of Students and Materials
    - Indoors
    - Outdoors
    - Partnership Planning Time
- Day 4 Questioning Strategies
    - Assessment
    - Sharing of Partnership Plans
    - Journals

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Major Concerns of EE in the Republic of China

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Introduction

To develop environmental education becomes a basic element of an integrated effort made by each country in tackling environmental problems. However, before meaningful approaches can be initiated to educate children and adults about environment, question such as "what should the main focus and major concerns of environmental education programs be?" must be clearly answered (Townsend, 1982; Yang et al., 1988). In addition to identifying the appropriate environmental concepts used in environmental education, it is also necessary to identify constructs (Entwistle, 1981) beyond those environmental concepts for appropriate use in environmental education.

Many researchers had made tremendous efforts in identifying the basic concepts that can be used in environmental education at different levels (Allman, 1972; Ballard, 1989; Brennan, 1986; Roth,1969; White, 1967). Moreover, knowledge of the underlying structure beyond those concepts has also been accumulated (Bowman, 1972; Chou, 1992; Isabell, 1972; & Townsend, 1982). When applying the research results to the practical environmental education development, different countries' specific conditions such as economy, politics, culture, etc. should be carefully considered (United Nations Educational, Scientific, and Cultural Organization, 1990). A comprehensive research program of environmental education was launched by the National Science Council [NSC] of the Republic of China (R.O.C.) in July 1987 (Wang, et al., 1987). Among those studies, very little effort except Chou's (1992) study has been directed toward a determination of the fundamental constructs that are appropriate for the R.O.C. (Chou, 1989; NSC, 1989; 1990; & 1992). Such information is essential for environmental related instruction, teacher's training, curriculum development, program planning, and environmental education policy formulation in the R.O.C.

Problem Statement

The problem for this study is: What are the underlying constructs appropriate for environmental education (K-16) as perceived by randomly selected experts in environmental protection, conservation, science education, and environmental education in the R.O.C.?

Objectives of the Study

The objective for this study is: To establish the constructs underlying the identified concepts as perceived by the subjects from experts in environmental protection, conservation, science education, and environmental education in the R.O.C.

Procedures

After a complete review of the related research and in consideration of the purpose of the study, it was decided that a structured type of Q-sort which uses forced sorting (a normal distribution with specified number of cards in each pile) and R factor analysis will meet the needs of this study. The basic components of the research instrument include: 1. a Q set (44 environmental related concepts, each printed on a card), 2. a sorting instruction, and 3. a questionnaire inquiring background information. Interdisciplinary review panels were used to select the initial concept base (contains 57 concepts), then reduce to 50. Afterwards, 11 experts were asked to use the Q-sort technique to sort the cards twice (one week break in between), to finalize the Q set which contains 44 concepts which were used in the research instrument. Experts also helped to review the content of questionnaire, and also the sorting instruction. Through the field test and pilot test (test and retest method was used), the face validity, content validity, and reliability (mean of Pearson's r = .55) were established.

Names listed on the directories of Environmental Protection Association of the R.O.C., National Park Association of the R.O.C., Science Education Association, and those personal subscribers of the Environmental Education Quarterly were used as the sampling frame (n=1398). A systematic random sampling method was adopted to select 280 samples from the frame.

All the research packets were sent by first class mail. The initial mailing was sent out in December 3, 1992. Totally, three follow-ups were sent to the subjects in order to increase the response. Totally 196 subjects (70% of the samples) responded to the survey and returned their research packet.

The major instrument which was used in data analysis was a statistical program called SYSTAT which was used in Macintosh (SYSTAT, Inc., 1992). R Factor analysis with a VARIMAX rotation on collected data was used to obtain constructs.

Analysis of Results

Research subjects were asked to follow the sorting instruction to sort these 44 small cards. These cards were to be placed into seven different piles (labeled 0 to 6) in terms of their relative importance ("6" the most important pile, "0" the least important pile) for environmental education, with specified number of cards in each pile. One key question they were to ask themselves when they sorted the cards was: "What should our students know about the environment?" The score for each statement was calculated according to the numeric label of the pile to which it belongs.

The results (the scores of each statement) of the Q-sort were used as the base for R factor analysis. By using factor analysis with an orthogonal (Varimax) rotation on the data obtained from Q-sort on each respondent, six factors were identified and treated as constructs which were the main focus for this study.

Factor Analysis Results

Six constructs were identified from the factor analysis. Altogether, they can explain 35.0 percent of the total variance (Table 1).

Table 1
Results of Factor Analysis on the Q-sort Result

Factor	Eigenvalue	Added (%) variance	Cumulative percent (%) of total variance
I	4.13	9.40	9.40
II	3.11	7.07	16.47
III	2.47	5.60	22.07
IV	2.13	4.83	26.90
V	1.80	4.09	30.99
VI	1.77	4.01	35.00

The retained six factors and the corresponding concept statements with rotated factor loadings are shown in the following tables.

Factor I

Table 2
Factor I and the Corresponding Concept Statement with Rotated* Factor Loadings

Concept		Rotated factor loading
40.	All living organisms have the right to live on earth and strive to survive. This right can not be deprived, no matter whether they can be used by human or not.	-.58
10.	During different kinds of human settlement and development, human have the responsibility to maintain the living environment in order to upgrade the welfare of all people.	.54
9.	We humans are also a part of the nature. We are not superior to other living organisms.	-.53
17.	Conservation responsibilities should be shared by individuals, business and industries, special interest groups, and all levels of government and education.	.51
23.	Living things are interdependent with each other and their environment.	-.49
41.	Energy, its production, use and conservation are essential in the maintenance of our society.	.47

Note: *Varimax rotation

Factor II

Table 3
Factor II and the Corresponding Concept Statement with Rotated* Factor Loadings

	Concept	Rotated factor loading
39.	Natural resources are limited and should never be wasted.	.59
33.	Most natural resources are vulnerable to depletion in quantity, quality, or both.	.54
6.	To manage the environmental pollution, prevention beforehand is more effective than compensation and treatment afterwards.	.54
25.	Natural resources affect and are affected by the material welfare of a culture and directly or indirectly by philosophy, religion, government and the arts.	-.51
28.	The natural environment is irreplaceable.	.47

Note: *Varimax rotation

Factor III

Table 4
Factor III and the Corresponding Concept Statement with Rotated* Factor Loadings

	Concept	Rotated factor loading
4.	We are ethically responsible to other individuals and society, and to that larger community, the biosphere.	-.69
11.	Humans have a moral responsibility for their environment decisions.	-.65
35.	Forest are an important part of the global ecosystem that supports us and of which we are a part. Deforestation (cleaning an area of all trees) will cause an immediate loss of wildlife habitat and natural resources. Long-term effects may include desertification and climate change.	.55

Note: *Varimax rotation

Factor IV

Table 5
Factor IV and the Corresponding Concept Statement with Rotated* Factor Loadings

Concept		Rotated factor loading
30.	The management of natural resources to meet the needs of successive generations demands long-range planning.	-.62
1.	Humans should play a role as understanding the nature and cooperating with other members of the nature.	-.60

Note: *Varimax rotation

Factor V

Table 6
Factor V and the Corresponding Concept Statement with Rotated* Factor Loadings

Concept		Rotated factor loading
3.	In any environment, one component such as space, water, air or food may become a limiting factor.	-.63
13.	Environment is the sum of all external conditions and influences affecting organisms. The environment may be divided into biotic (living) and abiotic (non-living) components.	-.56

Note: *Varimax rotation

Factor VI

Table 7
Factor VI and the Corresponding Concept Statement with Rotated* Factor Loadings

Concept		Rotated factor loading
37.	There is a maximum human population matched to each resource base. Population cannot exceed this level if a satisfactory standard of living for all people is to be maintained.	-.66
44.	Increasing population and per capita use of resources have brought about changed land-to-people or resource-to-population ratios.	-.65
27.	Family planning and the limiting of family size are important if overpopulation is to be avoided and a reasonable standard of living assured for future generations.	-.59
26.	Humans should never do whatever they want. Because everything we did will have unexpected influence on other people and living organisms no matter now or future. Therefore, humans should always use environmental ethics as the base for making value judgement.	.48

Note: *Varimax rotation

Naming the Constructs

Five professionals from the areas of environment, education, and conservation had provided assistance during the construct-naming stage. Delphi-Technique was adopted at this stage. Panels carefully looked into the meaning and implication of the concepts of each construct. After two rounds of exchanging and sharing the opinions, they reached the consensus on the names and implied meanings of the constructs. These six constructs were named as: Interaction and Interdependence, Resources Conservation, Environmental Ethics, Environmental Management, Ecological Principles, and Carrying Capacity and Quality of Life.

Discussion

The main goal of this study is trying to identify the underlying constructs which coincide with the current environmental situation in the R.O.C.C and provide the base for the relevant development of environmental education. Through the assistance rendered by invited panels, the identified constructs and its implied meanings were listed and discussed as following:

1. Interaction and Interdependence

   Within the environment the living organism, human, and even the different sectors of the human society are interacting and interdependent with each other. Therefore we have to understand this unique characteristics of interaction and interdependence.

2. Resources Conservation

   Human society and its cultural development have very close relationship with the natural resources. Because the natural resources are limited, humans have to use it carefully by the way of considering the sustainability of natural resources.

3. Environmental Ethics

Humans are also a member of the whole ecosystem. Therefore, we have to have the correct attitude, behavior, and responsibility to respect the earth and all other living organisms.

4. Environmental Management

The welfare of human life are depending upon the appropriateness of managing and maintaining the environment. We have to use the environment carefully in order to avoid damaging the earth and threatening the life of our future generations.

5. Ecological Principles

To understand the nature and the principles of ecology are very essential for maintaining the balance and stability of ecosystem.

6. Carrying Capacity and Quality of Life

The amount of human population and human behavior have direct influence on the natural resources, environmental quality, and quality of life. Therefore, we have to make adequate adjustment and regulation on the amount of human population and human behavior.

Implications and Recommendations

Implications and recommendations for the future study and other researchers were given as followings:

1. The six constructs identified have very important meaning to the clarification of the major focus of environmental education development. It represents that the real concerns of the environmental education contents should involved all facets of the environment instead of only limited to one or two directions.

2. The findings provided a very valuable reference for the future environmental education curriculum and instructional materials development for different age groups. Those constructs can be used as the major axis leading toward direction for developing different levels' curriculum and instructional materials.

3. The findings can be provided to the related governmental agencies using as a good reference for the determination of the important directions for the environmental education related efforts such as policy planning and teacher's training (both pre and in-service training).

4. This study used R-factor analysis to extract the underlying constructs of the environmental concepts. Further study could also try to use Q-factor analysis (to treat the subjects as the independent variables) to analyze the data in order to understand any different types of attitude underlying the research subjects' mind toward the environment.

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Heron Lake Environmental Learning Center (Here and Now)

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It was the latter part of 1989 when a group of very diverse citizens in western Jackson County Minnesota, including local elected officials, farmers, nature lovers, main street business persons, bird watchers, teachers and hunters came to a common agreement that an intensive effort in environmental education was needed for southwestern Minnesota.

The core motivation for this coming together was the emerging process of restoration of wetland and natural areas especially the nationally known Heron Lake and the recognition that environmental education is needed to accompany these improvement activities so that "the history of lake degradation would not repeat itself." At that time, no year round nature center existed in southwestern Minnesota and environmental education as mandated by Minnesota was not regularly taught in area schools.

This led to the incorporation of the non profit Heron lake Environmental Learning Center (HLELC) in 1990 to serve both adult and youth audiences as a way to establish widespread environmental ethic in the prairie wetlands of a multi county agricultural area. The group began its work with the goal of establishing a waterfowl interpretive center but soon switched its strategy when it became apparent that a single center could not reach the areas that need to be serving. An innovative alternative was identified in the form of an ECOLOGY BUS-a retrofitted transit bus with built in science lab and other teaching equipment-as used in Sweden.

The primary education technique to be used by HLELC in its study of wetlands and prairies will be the use of the ECOLOGY BUS. However other programs have been developed and are use at the present. Programs such as Project wild and Aquatic workshops for teachers with graduate credit, workshops for K-12 students covering water studies of lakes, rivers, creeks and wetlands. A resource Guide that helps schools implement Environmental education into already existing curriculum, and field trips where and when needed by schools in the 12 county area of southwestern Minnesota.

The Ecology Bus would provide an Ecology Specialist to develop curriculum and outdoor natural area teaching stations (NATS) for use by staff of the Ecology Bus and cooperating teachers. This curriculum development work will also include the provision of consultation services to local, state, and national natural resource management agencies in an area to develop coordinated program involving the Ecology Bus. The evaluations of curriculum program "start up" and operating procedures, plus the two year Ecology Bus project will be widely distributed to program participants and to other agencies interested in undertaking a similar or related program.

The HLELC Environmental Education objectives are:

1. To demonstrate the teaching effectiveness of an Ecology Bus in wetlands and other outdoor setting.
2. To develop general and site specific K-12 curriculum for the study of wetlands and other natural areas in the service area.
3. To develop guidelines and cooperative methods for cooperative educational programming between resource management agencies and K-12 educators on wetland and other environmental education which will comply with a multitude of educational mandates.
4. To develop curriculum and teaching materials which will coordinate classroom and field study education regarding wetland and other natural areas.

The target audiences for this project include K-12 teachers and students in 35 Minnesota School Districts, educational curriculum coordinators and developers in Minnesota school districts and natural resource management agencies and other agencies interested in developing field study in natural areas.

What makes the HLELC unique is the lack of a brick and mortar. The Ecology Bus would provide a mobile center to hundreds of sites that would otherwise be unknown by schools, teachers, and students. By transporting students to a variety of natural sites opportunities while on the bus, concentrated periods of instruction for up to a full school day and the opportunities to use an assortment of curriculum in coordinated ways such as soil, vegetation and water testing, wildlife observation and study, habitat improvement, and overall documentation on the ecosystem under study. Teachers proceed through this process under guidance of a Naturalist-Driver of the Ecology Bus and using curriculum developed by the program specialist. Additional specialists from natural resources management agencies may also be present. The design of these extended field studies can also include other subjects such as art, language arts, social studies and math.

The continual collection and analysis of the results of the program specialist, often at teacher service workshops and summer institutes will result in participating schools having a variety of natural science program that perform "real science" and teachers who will be able to design additional field study programs in the future especially when they have the assistance of natural resource management staff who are involved in the project and will likely develop a continuing working relationship with area schools and the Heron Lake Environmental Learning Center.

Another factor in using a mobile center is the cost effective nature of this type of program. It costs less--$270,000--for two years of use including building the bus, equipping the bus, staffing the bus, and materials for student use. Because of the innovative and cost effective nature of the Ecology Bus, an appropriation was sought from the Minnesota Legislature through its Legislative Commission on Minnesota Resources to purchase and equip such a bus. Funding was appropriated by the Legislative to put such a bus on the road in the Fall of 1994 provided that on fourth of the cost of the Ecology Bus Program be raised by the Heron Lake Environmental Learning Center. In the fall of 1992, a fund raising drive was organized to meet this requirement.

By the time the first Ecology Bus is put into service in southern Minnesota (and the first in North America), a significant amount of effort will have been put forth by volunteers and staff of the Heron Lake Environmental Learning Center to ensure success of the program. During 1992-93, HLELC staff have consulted with and obtained commitment from over 50 schools to utilize the Ecology Bus during the 1994 school year. In addition, preliminary curriculum design has begun with a number of natural areas which will be used as outdoor teaching stations by teachers. This type of consultation will be a continuing year-round process within the Ecology Bus Program and several hundred natural areas within a 15 county area are being developed for school use in the upcoming years. 1993 is ONLY THE BEGINNING!

Heritage Education on the Blackfeet and Flathead Reservations, Montana

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Glacier National Park, using grant funding provided by the National Park Foundation has developed Work House, an environmental/heritage education curriculum for use by Native American fifth and sixth grade students. The program is culturally attuned to Native American needs, perceptions, and traditions. The Environmental Heritage Education Program for Native Americans was prepared in cooperation with the Confederated Salish/Kootenai and Blackfeet Nations. The Blackfeet Reservation borders Glacier on the east while the Salish/Kootenai Reservation is approximately 50 miles southwest of the Park. The tribes involved have a history of past use of the Glacier National Park area.

Glacier National Park was established in 1910 by an Act of Congress. The area had been explored and settled by Anglo-Americans for less than a century prior to the establishment of the park. Until the late 1800's, the primary inhabitants of the surrounding area were the Kootenai, Salish, and Lower Pend d'Oreilles on the west side of the Continental Divide and the Blackfeet on the east side of the divide.

The west side tribes belonged to a loose confederation long before they were formally confederated by the U.S. Government. The Hellgate Treaty formally established the Salish/Kootenai Confederation and moved the member tribes to the Flathead Reservation in the Flathead Valley of western Montana.

To the east of the Continental Divide, the Blackfeet Nation consists of four major subdivisions: the Siksika or Northern Blackfeet, the Kainah or Blood, the Northern Piegan, and the Southern Piegan or Pikuni. By the beginning of the nineteenth century, the Blackfeet occupied and controlled most of the area from the North Saskatchewan River south to the Missouri and Yellowstone Rivers, and from the Rocky Mountain front in the west to the mouth of the Milk River in the east.

Historically, the area that is now Glacier National Park served as a buffer zone between the tribes of the Salish/Kootenai Confederation and the Blackfeet. Blackfeet and west-side tribes made occasional journeys into the park area to hunt during favorable seasons. During the heat of summer, the area was a pleasant place to mix business with pleasure, and bands congregated at selected sites in the park area to hunt and gather, to hold reunions of the various related bands and, to perform important religious ceremonies.

The 130-page Work House curriculum, using Native American oral tradition and scientific fact, focuses on the processes involved in the formation of mountains, the dynamics of glacial erosion, and understanding relationships within the plant and animal communities that have resulted from those processes. Human influence on the region is also addressed. These themes and concepts are part of the upper elementary school statewide science learning objectives and, therefore, directly relevant to the reservation schools' curricula.

The targeted audience for this program is fifth and sixth grade Native American students. A major program goal was to create a culturally and scholastically relevant environmental curriculum. Program developers have attempted to produced a curriculum that looks to the pride inherent in the historic relationship of the local Native American tribes to the area that is now Glacier National Park. What did this area mean to them?; how did they relate to it?; and how did children traditionally learn about their environment before the coming of white culture? With these considerations in mind, the program was designed to combine Native American pride, history, and culture with an accurate contemporary environmental science curriculum.

Work House tracks are structured to resemble the Native American hands on, "learn by doing, education for life", apprenticeship style of schooling that was traditional to the people before the coming of the Anglos. One term that Native People used to describe that process translates to "work house", the title of the program.

Early in project development, park staff decided to incorporate the wealth of traditional stories from the Blackfeet and Salish/Kootenai which explain natural phenomena like mountain building, glaciers and glaciation, and animal life histories. Much learning was, and is, transmitted through oral tradition and many stories were created to give Native children entertaining accounts of how natural phenomena and important customs and information originated. The frequent repetition of these stories by story tellers instilled important information in the minds of the children. Traditional stories related to the topics and themes of Work House were chosen for use in the program. From the traditional stories, a transition is made into contemporary explanations of natural phenomena in a story format. These stories are followed with hands on activities that help the students internalize important dynamics and information relevant to the subject matter. Suggested follow up activities and experiences are provided after classroom and park visit activities are completed. Relevance of these activities to Native American tradition and current Native culture and values is constantly stressed.

Finally, activity kits containing most of the materials, books, background information, and artifacts that teachers would need to present the pre-site activities and background needed to take part in the program were produced. Several kits are circulated in each reservation school district. These kits save immense amounts of preparation time and ensure maximum use of the program by teachers.

A list of human resources from the region including Glacier National Park is also included in the curriculum. The resource people, including tribal elders, park staff, educators and others are available to assist teachers in implementing the program.

Native Americans have lived in this country for thousands of years and their story is an important part of Glacier National Park's cultural heritage. The Park's goal for developing the Work House curriculum was to produce environmental education materials relevant to the way of life and cultural heritage of the Native Americans that live in the vicinity of Glacier National Park. With the addition of this program, several hundred Native American students are now becoming reacquainted with their historic ties with the Glacier National Park region while studying area physical and natural science.

While Work House was developed for use on the Flathead and Blackfeet Reservations, it is also available for use by other educators. Several local non-reservation school districts are currently using the curriculum as part of their science and social studies programs. An unanticipated benefit of Work House resulting from its wide spread use by non-reservation schools may be a better understanding of Native American culture by local Anglo students. Copies of Work House, a Final Report on program development, and information on other Glacier National Park environmental education guides can be obtained by writing or calling: Glacier National Park, Division of Interpretation, West Glacier, Montana 59936, (406) 888-5441.

Programming for School Groups

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Introduction

One of National Park Service Director Stephen Matter's early decisions was to create an Office of Education in the Department of the Interior in 1918. Today this decision is reflected throughout the National Park Service in its widespread Interpretive Operations programs. It has always been an objective of National Park Service Interpretation to education--to educate visitors, to educate employees, and to educate community groups about the importance of resources preservation and protection, and how to best interact with these resources.

Objectives

Every National Park area has a different story and their local school districts have individual requirements. Some parks have well established education programs, some have none. In response to questions and frustration at not knowing where or how to begin, an approach to the design and development of curriculum-based educational programs was developed. The resulting guide met these objectives:

- To introduce an approach to the designing and development of curriculum-based educational programs.
- To provide a theoretical basis for designing programs appropriate to developmental levels and learning styles.
- To create a network of innovative interpreters motivated to impact the quality of National Park Service educational services for school-age children.

The Course

A training course was developed for Environmental Education professionals. Examples and evaluations of model programs and partnerships between federal, state, and private organizations reinforce programming techniques.

The sessions that have been developed to meet the goals of the course include:

- Planning and Development
- Administering Education Programs
- Benefits of Programming for Educational Audiences: The Teachers Perspective
- Developmental Characteristics of Children and Audience Analysis/Learning Styles
- Elements of an Effective Program
- How to Get Started: Roundtable Discussions
- A Curriculum-based Approach to Programs
- Developing Educational Material
- Design and Production of Curriculum Materials
- Evaluating Educational Programs
- Logistics for School Groups
- Reading the High School Audience
- Park Partnerships
- Management's Perspective

The Future

The National Park Service has scheduled two 80 hour courses for Fiscal Year 1994. Lowell National Historical Park, Lowell, MA will sponsor a course in November 1993. Everglades National Park will host the training in February 1994. In addition, the National Park Service will work with other agencies and groups who need this training. Partnerships for funding, coordinating, and presenting courses have been productive in the past. For information on upcoming courses or to schedule others write or call: United States Department of the Interior, National Park Service, P.O. Box 37127, Washington, DC 20013-7127; 202-523-5270

Environmental Education Skills or Heritage Education Skills, 40 hour courses emphasizing methods and techniques, have also been successful. In February 1994 a course will be presented in partnership with Texas Parks and Wildlife Department. Contact: Leslie E. Dubey, Environmental Education Specialist, Big Thicket National Preserve, 507 Pine Street, Woodville TX 77625; 409-283-2117

Electronic Environmental Databases--Access -> Process -> Success!

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Assuring a position for environmental education (EE) in the formal school curriculum is a key objective of EE practitioners. While this may come about on a large scale by addition of new courses, fueled by state mandates and extensive preservice and inservice teacher education, infusion of EE is likely to continue to have the exciting possibility of exposing all students to the interdisciplinary nature of environmental topics. At this writing, for example, numerous national curriculum reform activities in science and geography promise what could become permanent homes for EE in classrooms. In both curricular areas, there is an increased emphasis on relevant subject matter, decisionmaking, collaborative learning, current issues, and the need for many types of information to be brought together to bear on these topics.

To operationalize the current goals of curriculum restructure, emerging technologies are an important curricular addition to be sought. A beginning has been made toward integrating curricular areas, utilizing remote technologies and data sources in classrooms, and focusing on individual responsibility for environmental quality (Fortner, 1991). Scientists have begun to recognize the necessity for public education about their work, and projects are underway through government agencies and universities to make information available for teaching about complex environmental problems.

There are numerous sources of environmental data available to educators, and this paper uses examples from a few. Environmental educators can seek out data they need from those who generate or store it, and use the data to help students take an Earth Systems approach to their environmental learning (Mayer, 1993).

Earth Systems Education is based on seven Understandings, all of which relate to environmental education (Figure 1, from Mayer, 1991). Use of data is important in most of the understandings, but especially in 3, 4 and 5. We can, for example, demonstrate that studying the environment involves more than one scientific method (e.g., we do not do *experiments* with the Earth (as in *the* scientific method), but study it using historical and descriptive data and observations). We can also combine databases from very different sources to show how various factors interact, and we can use historical data to demonstrate how environmental conditions and components evolve over time.

Figure 1. **Framework of Understandings for Earth Systems Education**

1. Earth is unique, a planet of rare beauty and great value.
2. Human activities, collective and individual, conscious and inadvertent, are seriously impacting planet Earth.
3. The development of scientific thinking and technology increases our ability to understand and utilize Earth and space.
4. The Earth system is composed of the interacting subsystems of water, rock, ice, air, and life.
5. Planet Earth is more than 4 billion years old and its subsystems are continually evolving.
6. Earth is a small subsystems of a solar system within the vast and ancient universe.
7. There are many people with careers and avocations that involve study of Earth's origin, processes and evolution.

CD-ROM sources. Most government agencies are now opting to store their volumes of environmental data on CD-ROM, a medium Green (1991) calls "a tool for coping with the knowledge explosion." At the same time, Green laments the fact that teachers have been slow to recognize and utilize the capabilities of CD-ROM to keep abreast of research and critical thought in their own fields. This medium has become extremely cost-effective (as low as $20 to produce a data CD), and at the rate of one CD to hold the data from 1600 floppy disks, it is also economical in terms of storage space. Some exciting CD-ROMs, with data and some images, include:

- Temperature and Precipitation, US, 1890-1989 (National Climate Data Center)
- Toxic Release Inventory, 1989 (to be released annually, USEPA)
- U.S. Census (U.S. Department of Commerce)
- Conterminous U.S. Landcover (USGS and University of Nebraska, Lincoln)
- Joint Educational Initiative (JEI; designed for teaching) (University of Maryland)

Data on these CDs are designed to be loaded into standard software spreadsheets for analysis and graphing, thus are accessible to many with a minimum of user training (Helgerson, 1989). As of 1993 most are designed for an MS-DOS platform.

Encyclopedic CDs are also available on environmental topics, such as the Audubon Birds of America and Mammals of America set, and the World Data disk __. Image disks with remotely sensed information and capabilities for image processing are also available for different parts of the US. A fact sheet on CD-ROM datasets is available from the author.

Disk-based datasets. Certain organizations and agencies make datasets available on floppy disks. These tend to be downloads from magnetic tapes, and can be personalized by the producer to meet the user's needs, e.g., state data, topic specificity. Again, MS-DOS format is most common for those produced by government sources, but Macintosh versions are usually available for commercial packages. Examples include:

- Christmas Bird Count (by state, from US Fish and Wildlife Service, Laurel, MD)
- CO2 studies, global change data (Carbon Dioxide Information Analysis Center)
- Water data, by state or watershed (US Geological Survey)
- *Global Recall* (world data HyperCard stack and more, from the World Game Institute)
- Ice formation on the Great Lakes (Great Lakes Environmental Research Laboratory)

Hard copy datasets can also be put into electronic format by students or teachers, and the material can be analyzed for very specific applications. Examples of sources of these data include:

- Published datasets in scientific journal articles (data have been preselected)
- *World Resources 1992-93.* Tables in the back are analyzed in early chapters
- Government technical reports (a fairly elusive source)
- Almanacs and resource reviews

There are usually no published guidelines for teachers to use data such as these, so applications must be created within course contexts. The global change capstone course in Ohio State's Geography Department, for instance, uses a special grouping of hard copy data in an "Environmental Insult" laboratory. From a small database of several widely differing countries, the magnitude of each country's regional and global insult to the environment is calculated. After scatter-plotting their calculations, students can group the countries according to their known developmental status. Calculating the insults with different relationships among the data will yield different groupings.

On-line Databases. With a modem and phone line students can be connected to numerous datasets available through electronic networks. Such data can be accessed in forms that are updated constantly, and in some cases can be added to by the users. Specialized networks that deal with only data exchange are available, mostly from government sources; for other networks data access is only one of many services offered. Some examples are:

- Accuweather and other weather satellite data capture networks
- USGS Earthquake Line, with daily reports of locations of tremors
- National Geographic KidsNet, sharing regional data and environmental measurements such as acid rain
- RTKnet (Right to Know), a private service combining the EPA's Toxic Release Inventory with the data of the US Census

A new pamphlet from ERIC (1993) describes the state of K-12 computer networking and its potential in all disciplines for the improvement of education through on-line communication.

Thus it is evident from even a brief overview of media that environmental data are available for classroom uses. Projects underway at Ohio State University, North Carolina State University, the Office of Sea Grant, Aspen Global Change Institute, the Geographic Alliance, and other organizations and agencies promise to offer teachers more and more opportunities for use of such data in classroom EE.

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Views of the Future--Results of Pilot Studies About Environmental Education

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The purpose of the National Consortium for Environmental Education and Training (NCEET), funded by the U. S. Environmental Protection Agency, is to enhance the nation's environmental education efforts, with a focus on K-12 classrooms. NCEET staff sought guidance from environmental education professionals and from classroom teachers in beginning to implement its programs during the fist year of its existence. Small, informal pilot studies have been conducted on several specific issues.

The purpose of these efforts has been to re-examine the set of activities we had originally proposed to implement, in light of experts' perceptions of what were the most critical needs; to seek teachers' input on what would be helpful to them; and to focus the Consortium's efforts on areas which seem potentially the most fruitful from a long-term perspective. This report summarizes the results of the pilot studies which were conducted as a part of these initial investigations.

It is important to note that these efforts were meant to inform an implementation program. They are not formal research studies, but their results do reflect findings from the literature, as well as many comments and suggestions that were made during several discussion sessions and telephone interviews with environmental education professionals. Further details on the studies are available in NCEET technical reports (Bardwell, Monroe, MacFarlane and Silver 1992, Cappaert 1992, Cappaert and Heise 1992).

NCEET hopes to serve as an increasingly useful resource to environmental educational professionals and to others concerned with broadening the implementation and the impacts of environmental education. NCEET staff felt that it was critical to ask questions that would enable us to improve our focus on basic needs as we began these efforts. The pilot studies were conducted to explore the following issue:

- What barriers do teachers face in bringing environmental education into the classroom?
- How can teachers currently learn about environmental education resources?
- How do professionals evaluate environmental materials?

Each of these questions has been the focus on one study. The results are summarized below.

Issue One: What barriers do teachers face in bringing environmental issues into the classroom?

A series of three focus groups with classroom teachers and administrators was conducted to find out what practical barriers teachers face which keep them from incorporating environmental issues in their classrooms. One session was held in Ann Arbor (a university town), another in Detroit (in core city areas) and one in Willow Run (a blue-collar community in the Detroit metropolitan area). Participants represent a range of interest and experience with environmental education, as well as grade levels.

The results of the focus groups strongly suggest that teachers rely primarily on personal contacts to find new curricular materials, regardless of subject matter. The participants indicated they would be unlikely to call a national source or to use a catalog. These and other remote sources would be inconvenient to access, and would be less likely to offer materials that would be relevant and/or capable of being easily adapted to local circumstances.

Besides personal references, the focus group discussions indicated that teachers are also likely to use new materials if they acquire them in a hands-on workshop. Having all the materials they need immediately available and being able to try things out before using them in a classroom were both perceived as being important in overcoming a general reluctance to try new approaches.

While such considerations may apply to new materials in a variety of topics, environmental materials may face additional obstacles. First, They don't explicitly fit into standard curricular requirements (this is true for Michigan schools; different circumstances exist in different states). Secondly, teachers say they feel inadequately trained to tackle what they assume will be scientifically-oriented materials, even if motivated to do so.

Issue Two: How can teachers, currently learn about environmental education resources?

A telephone survey was conducted of thirty-eight organizations where a teacher might expect a find information about environmental curricula. These included such groups as the Sierra Club, the National Wildlife Federation, and a few state departments of education. The groups were asked to describe what kinds of classroom materials they could recommend, and were asked where else they might direct similar inquiries.

This survey was not intended to be comprehensive, but rather to show whether any information source for a broad range of environmental curricula already exists, and, if so, whether other professionals were able to direct inquiries in the right direction. The results indicated that:

- most organizations would suggest only a narrow range of materials, often only those which they produced; and
- no consensus existed that pointed to any more likely source of information other than each respondent's own organization.

Issue Three: How do professionals evaluate environmental materials?

A questionnaire was distributed to participants in the 1992 EcoEd Conference in Toronto, to find out how professionals decide which environmental curricula materials to use or to recommend to others. Although based on a small sample (18 completed surveys), the results suggest that professionals would endorse materials which:

- include clear educational objectives;
- focus on issues that are timely and relevant to students;
- encourage students to take actions outside the classroom; and
- help students examine their own attitudes and values.

The survey respondents said they used current information on local, national and global issues very often, but that they used materials spanning several class periods, or materials requiring a predetermined sequence of presentations, relatively infrequently.

Besides highlighting the need to explicitly state educational objectives, it is also noteworthy that these professionals found that students' perspectives were very important in their own evaluations. Students' assessments were rated as more important than the assessments of professional colleagues.

This survey also included questions about what sources of information on new materials were most useful. The survey results corresponded closely with the focus group results, with a few additions. As before, training workshops and referrals from colleagues were likely sources of information. Training workshops were also rated as being particularly effective in introducing new teachers to environmental materials.

Libraries, magazines and newsletters from educational organizations were also considered important. But the most important source about new materials (for these conference attendees) was conferences themselves.

Discussion

Although these findings are based on small samples, the findings of the three studies are mutually reinforcing, and they echo concerns mentioned in the literature and in professional gatherings. Equally as important, the findings of these pilot studies offer insights which will guide NCEET's implementation efforts.

The need to explicitly identify connections between environmental resource materials and a given state's curricular requirements was clearly evident in these results. Without this, most teachers will not find such materials useful. Materials which emphasize interdisciplinary approaches and non-scientific topics may be generally appealing, as well as materials which help students understand connections between individual actions and broader environmental consequences, or which help students make their own decisions about environmental issues.

Other local teachers and teacher workshops are the most common avenues which teachers use in acquiring new classroom resources. EE dissemination efforts should target a variety of outlets, including magazines and newsletters from teachers' professional organizations and conferences, as well as the public media, instead of relying entirely on dissemination through environmental education professionals in order to reach a great number of teachers.

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Applied Biology/Chemistry--A Program Targeted at the Non-College Bound Student

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Applied Biology/Chemistry is a project sponsored by a consortium of state vocational education agencies and developed by the Center for Occupational Research and Development with the assistance of science educators. In the preface to the Teaching Resources Guide for this program, the developers provide the following description:

> Applied Biology/Chemistry (ABC) is a set of modular learning materials that integrates the treatment of biology and chemistry as a unified domain of subject matter. The purpose of ABC is to provide the science foundation for curricula in agriculture, health, home economics and certain areas of trades and technologies. It presents biology and chemistry in the context of work, home, society and the environment. It uses an applications-oriented approach to teach the concepts of biology and chemistry. Applied Biology/Chemistry emphasizes problem-solving, decision-making, and hands-on learning.
>
> ABC consists of eleven units that can be infused into existing courses or taught as a stand-alone course. Each unit is comprised of four to six subunits. They are designed to meet the needs of secondary students enrolled in vocational/technical courses, students interested in exploring technical vocational careers, and students in the middle fifty percent who may benefit from applied, hands-on learning.
>
> The materials may be used as infusible units by any teacher who needs to include concepts and applications of biology and chemistry in his/her own teaching. The issue of who might teach the materials as a stand-alone course depends ultimately upon local or state options relating to the course's place in the curriculum and the type of credit that it will be granted. (CORD, 1990, iii)

The above description includes several unique features: modular, stand-alone units, applications, integration of biology and chemistry, vocational and environmental focus and an acknowledged mid-range target population. The purpose of this paper is to identify issues in this curriculum that are of interest to environmental educators.

Nature and Development of ABC

Applied Biology/Chemistry is one of a family of courses often described as "Applied Academics" which also include Principles of Technology, Applied Mathematics and Applied Communications. These courses were all intended to improve the academic competence of the vocational student. The mid-range target population students are not generally college bound, but are, or should be, in the vocational programs called "tech prep" curricula. This is a significant audience for the environmental educator, because these students are often maligned as environmentally irresponsible in their immediate out of school years, as the 18-25 year old risk-taking, blue collar workers.

The "tech prep" curriculum is an option provided through grants to schools by the Carl D. Perkins Vocational and Technical Education Act of 1989. Under the guidelines of this law, a school can "partner" with a 2-year vocational/technical school, college and/or business in its area to form a consortium. High school students participating in "tech prep" programs take part of their course work at the participating institution and may be provided with part-time jobs in the community.

The nature of the program is also atypical. ABC consists of nine available units (Disease and Wellness, Continuity of Life, Natural Resources, Plant Growth and Reproduction, Animal Life Processes, Microorganisms, Nutrition, Water, Air and Other Gases. Funding for the development of a unit on synthetic fuels has now been secured, and there are design specifications for additional units relating to waste disposal and community of life (ecology). Each unit includes material which would typically be taught in biology and in chemistry, along with applications that would not typically be part of either course, especially the basic biology for the non-college bound student. There is no fixed sequence for the units, which are designed for about six weeks of instruction.

Because of the program's developmental history, the real world applications component of the program is very strong. From the unit titles, the connection to health related and to home economics and agriculture related careers is strong. However, most of these topics are relevant to the daily lives and basic scientific and environmental literacy of any non-college bound student. Curriculum materials include video support for the applications and social issues portion of the curriculum, an extensive array of activity choices involving lab-like activities, research and science, technology and society applications.

The program has a strong laboratory component. While each unit has 6-8 designated "labs", they are generally multi-day operations and require significant pre-and post-lab orientation. Many of the so called "activities" might be labeled "labs" in other curricula. Because of the developmental history, these labs are much more likely to be couched in occupational terms--eg. how does milk sour, how should sperm be stored for artificial insemination, DNA fingerprinting. At least two of the units, continuity of life and microorganisms, include more than one lab which uses recombinant DNA technology.

Teacher Training

The inservice teacher training component of ABC at the present time involves several challenges. The dependence of the American teacher on the textbook for scope and sequence has long been documented. This program requires that teachers select the units they will use and the order in which they will use them. Some topics, like microscope use and equation balancing, are simply taught at the point of first need. This decision process is a source of considerable discomfort for teachers in the early days of the training process.

Most secondary teachers identify themselves primarily as biology or chemistry teachers, based on their training or experience. They are more skilled in and comfortable with one field or the other. Because these materials are reordered, and a teacher may find herself/himself doing titrations and microbiology in the same unit, discomfort is built in for many teachers. This is exactly the same problem faced with environmental or science/technology and society courses and reflects the real complexity of environmental problems. While many states require that secondary teachers be trained in content area reading, and most school systems appear to be doing inservice on cooperative learning, those two areas seem to give implementing teachers the greatest difficulty.

The ABC textbooks are softbound, printed in two colors, and contain only diagrams and not photographs. They appear deceptively easy to read. Sentences are not long, and the scientific vocabulary is reduced, compared to many texts. The text is interrupted by a scenario which deals with ethical or environmental issues) and runs through each subunit, as well as numerous activities.

Many of the target students in this program are reluctant readers. Getting students to simply read the text, let alone read with care, is a problem.

Many of the activities require student research. Library skills will have to be taught, and the media specialist will need advance information about various aspects of the program. It is important that during the training, teachers use a typical high school library to find the kind of information they will be requesting of students, so that they will know what they need from their media specialist. Even more important than library research skills is the ability of the student to use the local community as a resource and to connect school learning to community and environmental issues.

Many of the ABC activities require students to work together in groups. Science teachers frequently have groups or pairs of students work together in laboratories but often do not teach the necessary group cooperation skills. They often assume that such instruction occurred in middle school, when that may not be the case.

Much of the socially relevant material requires that groups of students acquire and present information. Again, science teachers do not have a lot of practice in doing so, and appear to need instruction in and modeling of procedures for handling group activities. Either these teachers have not been exposed to cooperative learning techniques, or they do not make the connection between their use and the activities proposed for this course.

Implementation Issues

Three public relations activities will be incumbent on a new ABC teacher: interpreting the program to other academic and non-academic personnel, identifying and using community resources, and developing support and procedure for obtaining needed equipment, facilities and supplies. Teachers often feel that factors beyond their control sabotage their ability to make programs work. This program will require external cooperation, and teachers need to be taught explicitly how to obtain that support.

Program interpretation involves internal and external audiences. The implementing teacher has to share her/his understandings of the nature and target audience of this program with the following: administrators, vocational instructors, science colleagues, counselors, parents and students.

Application components require significant use of community resources. Because vocational programs generally have advisory committees, this structure can be used to the advantage of these programs.

The Creative Journal as an Action-Reflection EE Tool

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Introduction

The Creative Journal is an evolutionary form of the classic naturalist's, explorer's, inventor's, artist's and even An Edwardian Lady's, Journal. Since the earliest days of natural history studies, conservation education, outdoor education and, to a lesser degree, environmental education, the journal or diary was utilized by many as an instructional tool and a personal learning tool. Students used the journal on hiking, canoeing, sailing, and all forms of extended and shorter day trips as a mechanism for recording observations and insights into the experience in natural systems. Others used the journal as an observational record book to record personal insights to data being collected on projects and the interactions encountered in the endeavor to complete a project. Sometimes the product was called a journal, while others called it a log, or a diary.

Insights into the Role of the Creative Journal

The authors have explored the perception of what the difference among each of these descriptive terms means to more than 1,000 students K-12, teachers, and business executives. The overwhelming common perception is: a **journal** is a place (book, computer, card file) where I record or collect information, observations and personal expressions, when stimulated to do so, about what I am experiencing and feeling, initiated by things outside myself as I interact with the total environment; it is directed at phenomena outside of me and how I interpret or use it. A **diary** is a personal account of my feelings and insights drawn from within myself, about myself and my interactions with others and the environment, generally written on a daily or frequent basis (most common participant response, a diary is very personal—a journal is more about things, places, happenings and me). A **log** is a place where I systematically record my observations and data about what I have seen or done. Typically a log is seen as having minimal personal reflection expressed relative to the recorded observations and data. Dictionary definitions are even less definitive, often defining a journal and diary as essentially the same, and a log as a factual based account of what has occurred in an environment.

Since John Dewey's formalization of "Action Learning Theory" (currently referred to as "action-research"), often reduced to the tenet that "one learns by doing," critical reflection has been recognized as an essential element of the learner's progression through a complete learning experience that results in the understanding of new concepts. The journal or written reflection of what has been learned, was, and is, a tool that many effective teachers utilize to facilitate the need for the learner to reflect on his/her personal learning experience and processes and, by writing or artistically connecting the insight to previous experience, construct new understanding. This tool has become a core element in the instructional delivery of "whole language" approaches to current language arts instructional practice and is gaining greater application for similar ends in the environmental education context.

My personal journal work has been greatly influenced by colleague Bob Samples' journal model. The journal became a very important tool for planning, reflection, and for accessing deeper environmental insights and connection to work and a sense of place. Most of our Lee District Schools EE Program staff and I made journalling, as described, a regular part of our personal experience and the experience of our students. The practice was almost always judged by both teachers and learners to be positive, and an effective way to gain insight and perspective on what was experienced and what was learned. It was not until 1976 that I was introduced to a new perception on what a journal could be as a truly proactive stimulus to learning beyond its rich capacity as a reflective learning support system. The opportunity came after participating in the first General Electric intensive institute for upper level corporate executives entitled the Applied Creative Thinking Institute. General Electric, through its Director of Corporate Training, Ned Herrmann, synthesized the latest research on the human brain, learning theory, creativity theory and practice, management systems and group dynamics theory into an intense week long residential experience in the Blue Ridge Mountains of Virginia. After the experience as a participant, I was invited to serve as an instructor. One of my first assignments was to create a more sophisticated creative support system in the form of a journal that participants would enthusiastically use to work on creative problem solving and to enhance their attainment and harvesting of epiphanies known in creativity circles as "AHAs!"

This effort led to reviewing the literature on journal keeping, an examination of the journals (originals and partial reproductions) of Thoreau, Edison, Darwin, Mead, DiVinci, Einstein, Lewis and Clarke, as well as many contemporary professionals who are considered leaders in their fields in the arts, science and business. An important commonality was discovered. The large majority of these journal keepers both wrote in their journals and made drawings, paintings or sketches in their own style and form (often very primitive and crude in form). An examination of current knowledge of human brain research affirms each of these people adopted a journal keeping strategy that engaged the physiological participation of the entire brain mind system by using both abstract letters and words and picture representations to reflect on life experiences.

Lessons learned from facilitating more than 250 Creative Journal Keeping workshops, school assembly programs doing journal activities with thousands of students from preschool through age 96, teachers, administrators and corporate executives, a handful of activities emerge as the most engaging. After a short introduction to being a better observer by "seeing" more effectively and a few pointers on drawing techniques, the following activities prove very effective and supported by participants:

- Draw a pine cone in 3-D and write a description of exactly what you see and feel relative to the cone you have studied.
- Double Entry Journal Activity: Separate a page into two segments or use two adjacent pages and on the left page/column write the heading Reflections and on the right page/column write Observations. Then experience an object, event, or place in a natural system recording in writing and images all the data-based observations you think are meaningful on your Observations page/column. Then on your Reflections page record your inner feelings, insights and expressions that are based on data totally within you, relative to what you have observed from external data.
- Many abstract art activities become effective stimuli for writing about the environment and one's insights and understanding about an environmental concept. Connecting two or more seemingly unrelated things (an object or event) with an environmental understanding provides a fresh stimulus to environmental insights.

Each of the sample activities as well as 150 others have been designed and field tested to assure they have a high potential for connecting a personal experience in the environment with deeper understanding of environmental concepts and feelings.

An interview survey conducted by two coauthors with five peer students, each of whom were judged based on past performance and personal expression to be negative about "doing" journals, found a consistent pattern in response to what it would take to make a journal activity fun for you to do. The mini-study found that negatively disposed students at middle level grades want to be allowed to draw or write in a way that connects to something in which they are really interested. The authors suggested an assignment where students are given an object or event to create an image of, or write about, and then connect that environmental stimulus to the thing they enjoy doing the most outside of school with another related image or written piece. In each case those who created a graphic medium are asked to write brief phrases or words to describe their image, and those who write are asked to add a color background, collage of images or sketches to their writing. The activity developed proved effective in engaging disinterested students in working reflectively in their journal relative to environmental education concepts.

Conclusion

Historically journals have been effective tools to document environmental encounters, experiences and insights. The concept of a Creative Journal extends the tool's effectiveness to be applied in proactive learning strategies by the journal keeper as the journal not only becomes a reflective tool on the past, but encourages to make new connections to synthesize new possibilities, new solutions to environmental problems and concerns while simultaneously helping the journal keeper to be grounded in the realities of the now from careful documentation of personal observation through a variety of media and graphic techniques that blend words, artifacts and images. Creative Journals have proven to be very effective learning tools for all types and ages of students. Since the locus of control is centered on their interests and response, a pride of ownership, a sense of accomplishment, a persistence to task, a growth in creative expression, an improvement in observation and drawing skills, a mastery of communication tools are but a few of the results when Creative Journals are used as one of the "power-tools" of environmental studies and experiences. The "Basics" or educational practice reading, writing, arithmetic and, in essence, pattern recognition are all practiced and affirmed in the journalling process. "A picture is worth a thousand words," and, as Noel McGinnis proposes, is the first law of EE, "the experience is worth ten thousand pictures." A Creative Journal is the place to harvest all of the insights drawn from environmental experience by creating reflections in words and pictures that attach meaning to the experience!

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The "Monday Group"-A Successful School System Action Program (22 Years)

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Introduction

The Lee County Schools Environmental Action Seminar Classes, as they were originally called rapidly became known as the "Monday Groups" as the students participated in a full seven hours of class every Monday. Since then the program has been modified so that students meet every other Monday as well as participate in weekend camping trips and many evening and weekend activities. The Monday groups were initiated by the primary author as a direct result of the apparent feeling of low sense of locus of control exhibited by a great many students in the 1960's. The purpose was to create a program that prepared students to apply ecological knowledge, develop skilled and effective leadership and citizenship skills, develop a strong locus of control by practicing in "a real life context" informed decision-making skills with elected leaders and policy-makers and to "bond" students to the Democracy and to Nature. Students may participate in the program their junior and senior years in high school. Originally there were two Monday Group classes. One focused on developing and applying environmental action skills to affect policy change in our community; this class which became known as the "Action Group." The second Monday Group operated through nine years of program activities focused on students designing and constructing environmental facilities such as boardwalks, trails, outdoor classrooms, greenhouses and signage. The rationale for the class was that most of the participants would end up in careers in the building trades in South Florida and the course would better prepare them to perform in more environmentally sensitive ways. Due to changing Department of Education regulations and retirement of the certified teacher who team taught the course, the course had to be discontinued. After a three year void a new course was created that is called "Investigative Monday Group." In the Investigative class students meet and observe a wide range of government and private sector scientists and technicians who are carrying out "state of the art" environmental research, assessments, management practices and restorations. Students then decide what type of investigative action project they would like to undertake or to assist practitioners with.

The two Monday Groups meet at the Nature Center and Planetarium of Lee County where the Environmental Education Department has its offices and then from that base move out in the community to conduct their work. Since the mid 1960's the Lee District School System documents indicated that environmental studies included developing awareness and positive values, knowledge and understanding of the environment and the willingness and capacity to take responsible action. We viewed this as a simultaneous endeavor rather one of succession of awareness to action. Thus since the earliest program formulation we included the action component in everything we planned relative to the environment in our education program initiatives.

Program Design Elements

The Monday group concept was founded on the principles of learning expressed by John Dewey that incorporate what is now termed an action research approach of action-reflection elements. Since its earliest roots the program has emphasized research skills and acquisition of understanding of ecological and environmental concepts, a wide range of action skills such as: lobbying, communications, multimedia use, collaborative team building and operations, creative problems solving skills, leadership dynamics, mastery of group processes and a sense of connectedness or "bonding" to Nature and our Democracy. The dimension of mentoring is carefully applied to the learning setting.

The instructional program design for the District action program elements is uncompromising in its commitment that students be provided access to a wide range of value positions on any issue presented and that the range of views in the community have access to students as a part of a concerted effort to assure that students and community have a genuine understanding of the range of views and their underlying belief systems.

The Monday Group "Commandments" have become widely adopted in school based environmental action practice. They are in summary form:

- **Take a positive position**-be for something rather than against something.
- **Do your homework**-research and become knowledgeable about the topic you are working on.
- **Avoid stereotyping**-treat everyone as a unique individual of "high moral worth"
- **Examine the "force field"**-to find out what others know and believe and then get to know all you can about those of differing viewpoints.
- **Avoid Scapegoating**-if you fail to achieve your goal don't look for anyone but you to blame. You did not do some aspect of your homework effectively enough so **recycle** and do it again! (You never start the second time where you were the first time as you hopefully have learned a lot and know who the key players are.)
- **Be persistent**-environmental problems generally don't get to be problems overnight and they are not likely to be completely solved in a short time... never, never, never give up! Reexamine breaking the problem into smaller subparts to work on and gain success piece by piece.

In this type of program the teacher quickly shifts to being the class manager, coach and facilitator rather than the expounder of knowledge. Students must play the major role in taking responsibility for decision-making and always take full responsibility and consequences for the decision on what project they will choose to work on for the year. The teacher's skill is applied in providing just the right amount of support and coaching that assures student success.

Monday Group students have accomplished some very remarkable projects building boardwalks and trails, conducting community studies and effecting policy changes, including initiating and passage of a public tax referendum to buy the Six Mile Cypress Swamp, passage of the Bald Eagle Habitat Protection Ordinance, initiating the Florida Manatee Protection Act, establishment of a Manatee Public Viewing Park, and the adoption by the Lee County School Board of a Comprehensive Environmental Management Plan known as the GREEN PLAN, just to identify a few successes.

What is equally affirming is that those very same commandments and skills are being used by middle and elementary students in the District to accomplish similar ends. A class of fourth graders at Ft. Myers Beach Elementary School initiated an ordinance to limit collection of live mollusks and echinoderms to two live specimens per day. Four years after starting the initiative the ordinance has been enacted and enforced.

As a regular component of the Lee District Schools Environmental Education Comprehensive programs, teachers systematically tend to include an action element in the implementation of the study of the environment. The Monday Group model serves as a basis for effectively and ethically implementing action components at any grade level.

Conclusion

The "Monday Group" model has clearly demonstrated that it lends itself to transfer in regard to the philosophy, operating principles, skill activities, mentoring dimensions, and expectations for students. These program dimensions have been successfully transferred from primary to adult levels throughout North America. What does not necessarily transfer readily is the unique seven hour "pull out" instructional time frame that is utilized by both Monday Groups. Even within the Lee School District, high schools have had to create different forms of class schedules to accommodate the goals of the action program element. The toughest challenge to teachers is to provide guidance and support that nurtures success but at the same time be willing to let students take the "safe" risks of failure and learn from the reasonable consequences and thereby find the balance of "loose-tight management strategies."

Institutionalizing and Integrating A Mainstream EE Program (Over a 31 Year Period)

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Introduction

The Lee District Schools in Lee County, (Ft. Myers-Cape Coral, Sanibel cities), Florida has sustained an environmental education program since 1962. The program grew from a field oriented marine sciences, water quality monitoring, wetland studies, ecological systems instructional program foundation and became systemic at the secondary level in 1967 with an environmental education resource teacher and field studies mobile-laboratory bus that served all the District high schools at the time. A Department of Environmental Education was established in 1969-70 with the development and funding of a Title III-306 Environmental Education Grant from the HEW. Since its formalization, the District's Environmental Education Program has been formally recognized as one of Florida's, the United States and Planet's most outstanding local Comprehensive Environmental

Education Programs. The local school district currently supports 11 full-time staff members in the District Office of Environmental Education, primarily funded by local funds. This discussion will highlight some of the key strategies, design factors, program components and considerations that have characterized this program's more than quarter century of sustainability and effectiveness in a context where most of its original peers have experienced extinction.

Perspective and Strategies

The program roots have been steeped in the author's philosophy that not only life models but program designs and institutions are best developed based upon ecological models, viewed as a systemic endeavor founded upon a set of interrelationships that also are designed to accommodate: continual change, anticipate successional patterns and seral stages, rapidly adapt program form and function to a dynamic environment (politics, changing priorities, resource availability, personnel and community context), and to promote sustainability by living within means for growth and maintenance. The EE program has always tried to stay abreast of new research and trends in education and use its knowledge to stay on the "growing edge" of new practice. Since 1962 the program director and staff have had a passion for listening to teachers, students, administrators and community members in order to determine program priorities and initiatives. Today the education community calls this a "customer orientation."

The Key Elements of the Environmental Education Program

- K-12 Comprehensive Curriculum Framework provides the cornerstone for describing what environmental education is, what is to be mastered and how it is to be evaluated. The EE Framework document has gone through four major iterations and reexaminations, and is currently in its fifth major review and revision.
- Comprehensive District Environmental Education Field Trip Program: The field studies program is conducted primarily with eight EE school buses assigned to the Department staff who co-lead field trips with classroom teachers. Each student is engaged in a full concept-based instructional teaching unit organized into the 4-MAT Learning Styles model which is the foundation for the full day data collecting field experience for each student at least once a year.
- EE Products: instructional slide programs, more than 150 teaching units, resource activity guides, On Campus Activity Guide are provided to teachers. The Department produces instructional materials upon teacher request, as well as distributes many instructional materials from the public and private sector to teachers and students.
- Resource Services: The department provides services from rototilling school gardens to supplying canoes and camping gear, student journals, technical assistance on school landscapes, wildlife habitat development, gardening, instructional technology and curriculum.
- Communications: A newsletter Environmental Outreach, brochures, publications are provided to teachers and staff. A financially supplemented position of School Environmental Education Resource Contact Person is provided at each school. EE Contacts meet monthly in a training and information workshop and coordinate school activities and needs with the Department's resources and staff. An extensive network and close working relationship are sustained by staff participation and technical assistance to many citizen, business and governmental agencies that afford two way communications and collaboration. The goal is that everyone, from policy-maker to custodian, from parent to State Legislator knows what's going on in the program and has access to input.
- Inservice Programs: Many forms of inservice have been conducted for teachers, lead students, school administrators and community members, but are continually changing due to the dynamic character of time, interest and finances. The goal of inservice programs is not only to develop interest and competencies in participants, but to also build networks of support and to affirm participant's contribution to the district by making the sessions dynamic, challenging,

new-on the growing edge of practice, and affirming to the moral and growth of the participants. There is a virtual myriad of program activities or components that support the overall annually updated, District Comprehensive Plan for Environmental Education. In addition to the core elements there are program activities such as the extensive School Site Development and Wildlife Habitat Improvement Program entitled LEESCAPES, school gardening, School Site Environmental Assessments, two High School Seminar Classes known internationally as the "Monday Groups", a district Watershed Assessment Program with water quality testing, a full camping and canoeing program, Interdisciplinary High School Instructional teams using environmental studies as the program core, telecommunications and multimedia production, international program extensions and exchanges of teachers and students with Canada, Russia and China, a school-based, Junior Naturalist Program, field survey and instructional field trip development program with major real estate developers and community-based corporations, Bus Driver Field Studies training program, a volunteer training program, LEEWAYS inservice program, and an extensive model program adopted by the School Board to manage all operations of the School District in the most cost effective and environmentally sound manner possible called the GREEN PLAN. It has established a close funding and program relationship with the Lee County Mosquito Control District and the Nature Center and Planetarium of Lee County.

Conclusion

The list of integrated environmental education activities and initiatives could go on and on. The bottom line is the program has not only survived but grown and sustained higher levels of accomplishment over the years simply because it is very important to the community. The EE staff has always been selected for their excellent teaching skills, environmental interest, work ethic and a commitment to provide every service they could that teachers, policy makers, administrators and community members requested... but above all, it has not only listened and produced, it has done so in a way that is fair and balanced to a wide range of community views; it has sought collaborative solutions rather than competitive alternatives, it has been extremely creative in seeking a diverse funding base, it has remained dynamic and practiced the ecological strategy for managing. Finally, the Lee District Schools Environmental Education Program has bridged a critical step in sustainability as it has successfully transferred program leadership and operations beyond the founder's influence (after his retirement in 1992) with full continued support from the District and community.

Effectiveness of an EE Teacher Training Program

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Introduction

As of July 1, 1985 most teacher candidates in Wisconsin must receive instruction in seven environmental competencies (Engleson, 1985); and as of September 1, 1990 all school districts are required to have developed a "written, sequential curriculum plan" in EE (Wisconsin Statutes, Section 121.02[1]). However, as powerful as these mandates are for strengthening environmental education, there is at least one audience they haven't addressed-teachers certified prior to 1985. In order to reach these teachers and others interested in environmental education, faculty at UW-SP determined to develop a program of courses focusing on the special needs of teachers. This program began in 1989 (although discussions of such a program had been going on for years) with the formation of an advisory committee.

History

- Instructor Selection

The advisory committee to the outreach program consisted of public school teachers and EE and science education faculty at UW-SP. It was determined that the program would be most effective if instructors played a significant role in its development. Further, because the audience for the courses was statewide, instructors would be sought from across Wisconsin. Criteria for the course were set at: master's degree in environmental education or related field, teaching experience in the formal and/or nonformal sector, and professional involvement in EE. Given these criteria, approximately 50 potential instructors were identified and 25 instructors finally selected. Appointments were renewable every two years contingent on positive student and peer evaluations.

Following an initial orientation session, plans were set for the development of four core courses, with differential options for undergraduate or graduate credit[1]. Concurrently, a graduate student (Nancy Cripe) selected the project as her thesis and obtained a National Science Foundation grant to fund the project for one year.

- Course Development

Course development was completed through a series of workshops. In the fall of 1989, instructors began work on the first course-Principles of Environmental Education. The course was developed, revised, taught in a "dry run", and revised again. It was first taught in Fall 1990. Each of the remaining three courses was developed using the same procedure, with the last course being completed in 1992 by then program coordinator, Dan Sivek[2]. Despite completion of the core courses, professional development and revision workshops continue and are required twice annually for all instructors. Details regarding course development are found in Cripe's thesis (Cripe, 1991).

- Teacher Participants

By the end of the third year of the project, over 1,500 teachers will have enrolled in one or more of the courses at over 30 sites across Wisconsin. Demographic data indicate that a majority of courses have been offered outside of Wisconsin's major metropolitan areas (i.e., Milwaukee, Madison, Fox River Valley). Further, it appears there is a need to involve more teachers of minority students. These concerns are being addressed in the courses approved for the 1993-4 school year.

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[1] The first course, Principles of Environmental Education, provides an overview of why to teach Environmental Education; what help is available to the teachers; and where to find EE resources. The second course, Ecological Basis for Environmental Education provides basic ecological concepts that apply to interactions between humans and the natural world. The third course, Citizen Action in Environmental Education provides teachers with practical, proven methods for motivating students to take action and get results. The fourth course, Environmental Education Teaching Strategies show teachers where to get free or inexpensive award-winning environmental education programs and how to infuse them into their traditional district or classroom curriculum.

[2] As of August 1993, Anne Green is Coordinator of the EE Outreach Program. Ms. Green may be reached at: Wisconsin Center for Environmental Education, University of Wisconsin-Stevens Point, Stevens Point, WI 54481. (715) 346-4176.

As of 1992, a master's degree program has evolved out of the EE outreach program. This program is designed specifically for teachers and includes the outreach courses as a core. Specific elements include: the outreach courses, provision for transfer of credits, the majority of course work offered in summer, and a nonthesis project. Forty seven teachers have enrolled in the M.S. program in its first two years, with a substantial waiting list.

Evaluation

To assure that the outreach program is providing its desired impact, it is being evaluated in several ways. There are at least 4 evaluations being conducted on these courses. Three of these are discussed in some detail below. First, each course is evaluated by the participants/teachers and the instructors of the courses. There is also a peer review of the instructors of the courses, conducted by faculty of the College of Natural Resources. These peer reviews and course evaluations are utilized for renewal information and quality control. The instructor/course evaluations (see table 1) are consistently excellent to good, suggesting that the instructor selection and course development procedures were effective.

Evaluation of the impact of the outreach courses is being administered in two phases. The first phase involves the participants (or teachers) enrolling in the four outreach classes. Accomplishment of course goals and objectives by teachers will be determined by using a separate-sample pre-test post-test survey (Campbell and Stanley, 1963; described fully by Ham et al., 1988). At the onset of each course, a random selection of 50% of the participating teachers completes a three-page pre-test survey. The survey measures: a) knowledge of environmental education; b) environmentally-related attitudes; c) teacher behaviors (measured by the amount of instructional time weekly which the teacher has spent teaching environmental education in the classroom in the three months prior to the inservice course); and d) achievement of the specific objectives for the course that was completed (see table 2). Three months after completion of the course, all participating teachers are post-tested by means of a mailed survey. This survey measures a) knowledge of environmental education; b) environmentally-related attitudes; c) teacher behaviors (measured by the amount of instructional time weekly which the teacher has spent teaching environmental education in the classroom since the course's completion. Following Campbell and Stanley, analysis consists of comparing the pre-test results with post-test only (i.e., those who did not take the pre-test) results. Also achievement of the specific objectives for the course completed are measured. This method was selected because a control group would be difficult to find and it minimizes the possibility that teacher learning resulted from the pre-test and not from the treatment. Pre-tests from all the courses are combined, as are the post-tests. A two-tailed T-Test is then run to determine the difference in the mean knowledge scores. Chi-squares are used to assess the difference in the pre to post attitude and behavior questions. Presently there are sufficient data only for the first two courses.

Phase I also includes an evaluation of the success of the extended MS degree program. Success of this program will be measured by 1) the enrollment of at least 25 enrollees in subsequent years with at least 20 graduates by August 1994 and a total of 50 graduates by August 1995 and 2) evidence that each enrollee is serving in a leadership capacity in his/her school or district (as indicated by offering at least two environmental education workshops for colleagues prior to the completion of their degree program).

Phase II of this evaluation involves students of randomly selected teachers participating in at least three of the four teacher training courses, as well as students of teachers who have not taken any courses. The Solomon Four Statistical Grouping (see table 3) will be used in this phase of the evaluation. The Solomon Four was chosen for its ability to distinguish the actual gain of instruction by teachers trained in NSF courses from other extraneous factors. These include normal maturation/learning over the course of the year and learning' from the pre-test instrument. It is a superior to the two group control/treatment design where results can be biased due to pre-test influence. Phase II will evaluate a sample of students from random locations throughout the state of Wisconsin. Phase II evaluation is taking place during the 1993-4 school year.

Preliminary Results

- Attitudes

With regard to attitudes, there were significant differences in several of the teachers' attitudes subsequent to enrolling in the Principles of Environmental Education course (see table 4). In fact the researchers believe that differences were realized in virtually every attitudinal area of major importance, i.e., perception of having adequate training in EE, confidence regarding ability to infuse EE into the curriculum, and perception of ability to help the school district develop and implement an EE curriculum. In addition, teachers perceived they had a greater number of EE teaching guides available to them.

Subsequent to taking the Ecological Basis for Environmental Education course, one attitudinal item showed a significant change: perception of the number of courses which could have EE infused into them.

- Teaching Behavior

On the single item assessing level of EE instruction, there was a significant gain in the number of hours devoted to EE in the classroom each week, subsequent to enrollment in the Principles of EE course. No significant difference was reported in teaching hours subsequent to enrollment in the Ecological Basis for EE course.

- Knowledge

For the Principles of EE class, there was a significant difference from the pretest to the post-test (table 5) with regard to knowledge of environmental education ($t = -6.12$, $p = .000$). For the Ecological Basis for EE course, there was no significant difference (see table 6) in knowledge ($t = -1.61$, $p = .110$).

Discussion

As discussed above, teachers attitudes toward EE and the time spent teaching EE significantly improved subsequent to enrolling in the Principles of EE class. Further, teachers showed a significantly better understanding of the principles of EE after enrolling in the class. Thus, the researchers concluded that the Principles of EE class was effective in achieving its primary goal of increasing the level of EE instruction in the classroom, along with attendant attitudes and knowledge. It should be noted that on some attitudinal items there was no significant difference pre to post-testing. These include: the relative priority of EE in the school curriculum, perception that EE should be taught by select teachers, perception that additional funding is needed to teach EE, size of class being a barrier, perception that EE takes more prep time than other subjects, perception of having enough time to implement EE into the curriculum, perception of adequacy of science background, and perception of inability to teach appropriate EE related skills. While positive changes in these attitudes would be desirable, data need to be reexamined to draw firm conclusions. It may be for example that some of these attitudes were already positive, that some perceptions (e.g., having enough time to implement EE) are more strongly influenced by outside factors such as demands on teacher time unrelated to EE, or that some attitudes take more time to change.

With regard to the Ecological Basis for EE class results, the researchers drew two tentative conclusions. First, it appears the course does not increase the knowledge of participants. Possible explanations, which need further investigation, are that the instrument is not sensitive enough to detect differences. The instrument includes twelve knowledge items, which are primarily knowledge level in nature. Perhaps teachers comprehended the concepts and could apply them but were unable to recall purely factual information. It is hoped that a qualitative investigation being undertaken will help determine answers to this question.

Attitudes, with one exception, did not change from pre to post-testing in the Ecological Basis for EE course. This is not surprising, however, since attitudes had significantly changed as a result of enrolling in the Principles course which is a prerequisite. Additional analysis is needed to determine whether attitudes had remained positive and stable between post-testing for the Principles of EE course and post-testing for the Ecological Basis for EE course.

The Future

The EE Outreach Course program continues to undergo changes. The Principles of EE course is currently undergoing revision based on suggestions by outreach instructors, the advisory committee, and teacher participants. It is noteworthy that suggestions offered for this and the Ecological Basis course were incorporated into the final two courses. The researchers believe this helps to explain the more positive student evaluations for these courses.

Consideration is being given to marketing the courses. One state is investigating the possibility of adopting the courses for a similar program.

The researchers believe an EE outreach program such as this has great potential for reaching practicing teachers who have not previously taken EE courses. It has been shown that teacher attitudes, teaching time devoted to EE, and knowledge can be changed through taking these courses. Ongoing research will show whether, in the short term, enrollment in EE outreach courses affects participants' students.

Table 1
Participant Evaluation of Course/Instructors

	411/611	412/612	413/613	414/614
n =	415	85	25	28
Instructor well organized, therefore speaks well of selection criteria	x=3.56	x=3.51	x=3.55	x=3.29
Instructor prepared and informative	x=3.75	x=3.79	x=3.68	x=3.32
Expresses material clearly and completely	x=3.41	x=3.57	x=3.68	x=3.32
Enthusiasm and interest	x=3.76	x=3.86	x=3.88	x=3.46
Readings needed	x=2.79	x=3.17	x=3.22	x=3.14
Workload reasonable	x=1.67	x=1.82	x=3.88	x=3.71
Difficulty satisfactory	x=3.06	x=3.00	x=3.80	x=3.50
Overall instruction	x=3.53	x=3.83	x=3.56	x=3.75
Overall course	x=3.30	x=3.59	x=3.68	x=3.64

Table 2
Survey Instrument Design - Phase I

Pre-Post Test	
1.	NR 411/611 Principles of Environmental Education - Consists of 7 knowledge and 16 attitude questions
2.	NR 412/612 Ecological Basis for Environmental Education - Consists of 12 knowledge and 16 attitude questions
3.	NR 413/613 Citizen Action of Environmental Education - Consists of 23 knowledge and 16 attitude questions
4.	NR 414/614 Environmental Educator Teaching Strategies - Consists of 16 knowledge and 16 attitude questions

Table 3
Research Design - Phase II
Solomon Four Group Design

Group One: pre-test, no treatment, post-test
Group Two: pre-test, treatment, post-test
Group Three: no pre-test, no treatment, post-test
Group Four: no pre-test, treatment, post-test

Notes: Treatment: Refers to participation in at least 2 NSF teacher training courses.
8 groups will have teachers who have participated in at least 2 NSF teacher training courses.
8 groups will have teachers who have not participated in these courses.

Table 4
Statistical Results of Attitude Tested

#	Item	411 (n=449)	412 (n=99)
8	Additional Funding needed to effectively teach EE	NS	NS
9	Size of class will prevent me from teaching EE	NS	NS
10	Environmental education takes significantly more preparation time	NS	NS
11	I have enough time during the school year to implement environmental education into my curriculum	NS	NS
12	My science background is sufficient to teach knowledge and skills related to environmental education	NS	NS
13	I have adequate training and experience to teach environmental education	Pearson Chi-Square value=33.26768 D.F.=5 Sign.=.00000	NS
14	I am able to teach my students the skills which will allow them to be effective in resolving a local, national, or even a global environmental issue	NS	NS
15	Environmental education should be considered a priority in our K-12 education system	NS	NS
16	Environmental education should be taught by select teachers, such as science teachers, rather than having the majority of teachers in a variety of disciplines teach it	NS	NS
17	I plan to take additional environmental education courses	NS	NS
18	I feel confident in incorporating environmental education into my curriculum	Pearson Chi-Square value=24.25211 D.F.=4 Sign.=.00007	NS
19	I have adequate background to assist school district in developing and implementing environmental education into the curriculum	Person Chi-Square value=43.26881 D.F.=4 Sign.=.00000	NS
20	Number of environmental education teaching guides currently accessible to me	Person Chi-Square value=61.6504 D.F.=4 Sign.=.00000	NS
21	Approximate hours per week of environmental education taught	Person Chi-Square value=25.04199 D.F.=4 Sign.=.00005	NS

Table 5
NR 411/611
Statistical Results of Knowledge Tested

Group	# Of Cases	Mean	Stand. Dev.	Degrees of Freedom	T-Value	2-Tail Prob.
PRE	210	.4946	.168	447	-6.12	.000
POST	239	.6091	.220			

Table 6
NR 412/612
Statistical Results of Knowledge Tested

Group	# Of Cases	Mean	Stand. Dev.	Degrees Of Freedom	T-Value	2-Tail Prob.
PRE	31	.6694	.197	92	-1.61	.110
POST	63	.7288	.153			

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Ecology in a Classroom Community of Inquiry

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Introduction

> *We get to share notes and if I'm wrong or he's wrong I get to correct myself...and it helps us out a whole lot.*-6th grade boy
>
> *You know, some of the kids ask you "what's this?", "what's that?" and you just kinda feel like an expert.*-6th grade girl
>
> *They're constantly evaluating each other's work-which leads to bigger and better ideas.*-Eco-Inquiry teacher

These are the words of participants in Eco-Inquiry, a school-based ecology program for fifth and sixth graders developed at the Institute of Ecosystem Studies. Eco-Inquiry transforms classrooms into research communities, where students learn the science of ecology in ways that mirror how professional ecologists create knowledge.

Scientists ask and answer questions through investigations and controlled experiments, but equally importantly they interact with each other to establish productive modes and topics of inquiry within a discipline, build theories and uphold standards for scientific work. The methods, substance and spirit of ecological research that characterize a dynamic scientific community at places such as the Institute of Ecosystem Studies, are the foundation of the Eco-Inquiry curriculum.

The goals of Eco-Inquiry are to:

- help students build meaningful understanding of ecosystem dynamics through the study of food webs, decomposition and nutrient cycling,
- develop students' inquiry skills and habits of mind, and
- facilitate transfer of students' knowledge and skills to their everyday lives.

Eco-Inquiry achieves these goals by viewing learners not only as actively constructing knowledge and skills within their own minds, but also within the context of a community of learners (Bruner 1986; Resnick & Klopfer 1989). Educational theory and practice that have emerged in recent years as a result of cognitive studies in areas such as situated cognition (Brown, Collins & Duguid 1989), reciprocal teaching (Brown & Campione 1990) and cooperative learning (Johnson & Johnson 1989) support the notion that children benefit from the opportunity to learn as scientists do: by interacting as much with their peers as with the natural phenomena they are studying.

Building a Community of Inquiry in the Classroom

Pose Engaging Problems, Questions and Challenges to Students

A community of inquiry centers around topics of study that intrigue and motivate inquiring minds. Eco-Inquiry engages students in explorations related to their local environment and everyday concerns. Three core content modules each provide learning experiences that last from four-eight weeks:

Module 1: Who Eats What? Students fulfill a request from a local landowner, conservation group or the school board to survey a nearby piece of land (or the schoolyard) and map its food web.

Module 2: Decomposition Dynamics. Students explore microbial decomposition outdoors and in the lab, then work on a challenge to replicate natural decomposition in classroom decomposition chambers.

Module 3: Cycles-From Rot to Radishes. Students do research for a firm called Green Resources of the World (GROW) Unlimited to test the effects of a liquid made from dead plants on radish growth.

Performance and written assessments embedded within and culminating each module require students to extend and apply their learning to the real world. For instance, students set up outdoor learning stations to teach another class about reading food web clues in nature; they analyze a legal dispute between a landowner and a composting business then outline studies for a special investigator to pursue; and they test conditions that could promote the decomposition of biodegradable plastic bags.

Make the Purpose and Methods of the Community Process Explicit

Building a community of inquirers takes more than assigning students to work in groups-it requires establishing a classroom culture that supports inquiry learning. Typical school culture focuses on an individual's ability to give right answers to a teacher. An inquiry culture values being able to learn as much from being wrong as being right, supports risk taking and encourages sharing of ideas and debate about answers.

Students need time and support to acculturate to an environment that views learning as an active, collaborative effort, and positions the teacher as a co-learner and facilitator rather than a knowledge authority. Some tactics used in Eco-Inquiry for helping students adapt to an inquiry learning mode are:

Linking what students do to what scientists do. When students understand that scientists form and tackle questions together, communicate ideas and results and structure arguments that convince others of the validity of their conclusions, they are better able to internalize the protocols of scientific knowledge building. Eco-Inquiry includes activities to help students address their stereotypes of scientists, and read-aloud stories about the work of contemporary ecologists.

Two curriculum supplements called Mysteries in Ecosystem Science Audiotapes (MESAs) extend the focus on the nature of scientific knowledge building by presenting episodes of mysteries that students tackle along with scientists on tape. One of the important messages embedded within the MESAs is that research produces as many new questions as answers, and that scientific knowledge is constantly evolving.

Some Eco-Inquiry teachers make the scientific community theme tangible by having their students form and name their own research company, and then complete projects for clients. Working within a classroom company helps students develop self-images as researchers, and creates a context for authentic assessment techniques such as portfolio reviews.

Ongoing awareness of inquiry behaviors. Eco-Inquiry lesson plans provide guidance for teachers to make students constantly aware of the processes they are using and why. Also, students create wall charts of the inquiry skills and characteristics they feel are important to develop. These charts evolve and change as students progress through the curriculum.

Use Tactics that Encourage Discourse and Reflection

Working in cooperative groups. Students conduct most Eco-Inquiry investigations in pairs or groups. With practice they develop the social skills necessary to function as a productive unit, and then are able to experience the value of building on one another's ideas.

Writing as a medium of communication. Eco-Inquiry students keep track of their ideas and findings in journals that they draw on to make group contributions. They also send messages to one another on a form called "C-Mail" (community mail). Students write responses to a choice of prompts on the C-Mail sheets, such as: *What I'd really like to know is... An idea I have is... Now I understand that... I'm confused about...* They then send their thoughts to a friend who sends back a written response.

Peer review is another form of written communication used in Eco-Inquiry. Research teams submit experiment designs to another team for review. Often students use more exacting standards in reviewing their peers' work than they use for their own, which helps to draw out their capabilities without intervention from the teacher.

Interacting in meetings or "colloquia". At the beginning, middle and end of investigations students meet as a whole class for each group to share its thoughts and findings. These interchanges help students learn to articulate and defend their ideas, as well as to accept alternative perspectives.

Toward Ecological Literacy

Although Eco-Inquiry creates ecological research communities in classrooms, the program is not aimed exclusively at producing future scientists. Intellectual interchange and reflection sharpen critical thinking skills that are useful to all citizens. In the final section of Eco-Inquiry students read a book called Rita, about a girl who uses her mind and ingenuity to take a stand on the development of a local wetland. Students discuss Rita's actions and thinking style, and then investigate an environmental issue in their own community. This gives them an opportunity to put into action the knowledge, skills and habits of mind they developed with, and because of, one another.

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Building Students' Self-Esteem Through Ecology Concepts of Survival

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East Environmental Science Agri-Business Magnet High School in Kansas City, Missouri, is an inner-city school. East Magnet High School has the goals to build students' knowledge for scholastic success and to build students' self-esteem for social success. This will help students stay in school and have greater economic success in life. These goals will be accomplished by teaching students study skills, self-esteem building skills, human relations skills and stress management skills. Students' social skills are improved by using cooperative learning strategies, peer group interactions, counseling, hands-on classroom ecology activities, ecology field trips with team building activities and self-esteem building challenge activities. By relating students' self-esteem to ecology concepts of survival, students are motivated to improve their attitudes, health, attendance, grades, career options, environment, success in school and ultimately have more economic and social success in their adult lives.

Each of the following 18 numbers is followed by an Environmental Concept,[1] a Student Social Interest Issue or Related Environmental Issue* and a Self-Esteem Concept

1. Physical environment, molecular nutrient cycles, the history of the conservation and environmental movements * The physical component of cities, farms and nature areas * Students' personal identity

2. Classification of organisms, food chains, and food pyramid * Basic human nutrition for health, including balanced vegetarian meals, lean meat meals, eating more fruits, vegetables and whole grain products * Students' background and personal health, related to their identity

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[1] *Students' personal identity

3. Symbiotic relationships of organisms * Family relationships and group dynamics education * Students' connection with family and friends

4. Habitats, niches, behavior, and territories * Home improvement, work ethics, sports, JROTC, FFA, FHA, 4-H, Scouts, Boys and Girls Clubs, etc.* Students' interaction with school and social groups as an alternative to gangs

5. Plant, animal, and human population dynamics * Family planning, preventing teen pregnancy, parenting education and prevention of sexually transmitted diseases *Students' interactions with the opposite sex

6. Nonrenewable resources * Using public buses, conserving utilities, car pooling, home insulation and weatherization programs * Students' competence in managing money and nonrenewable resources

7. Renewable resources * Alternative energy resources and conservation of present resources * Students' competence in managing their own resources and renewable resources

8. Water resources * Water conservation and water management * Students' competence in managing water resources

9. Mineral resources * Recycling metals * Students' competence in recycling

10. Agriculture and soil conservation * House plant care, lawn care, composting yard wastes, gardening, planting trees, organic farming and sustainable agriculture * Students' competence in taking care of their families' plants, pets, lawn and garden

11. World hunger * Consumerism and eating habits * Students' competence in managing their own consumerism and eating habits

12. National, state and local monuments, parks and forests * Outdoor recreation, physical fitness and recycling paper * Students have a clear goal in life to take care of all natural areas, parks and forests

13. Urban land use * Housing, ethnic roots awareness, civil rights awareness and environmental justice * Students have a clear purpose in life to respect themselves and all other people, regardless of their ethnic roots, race, religion, ability or sex

14. Air pollution and noise pollution control * Drug abuse prevention: tobacco, marijuana, crack cocaine, cocaine, other drugs and avoidance of loud noise or loud music * Students have a clear purpose in life to practice healthy habits and to avoid addictive substances and unhealthy behavior

15. Water pollution control * Personal hygiene, public sanitation, preventing water borne diseases and alcohol abuse prevention * Students have a clear purpose in life to have good personal hygiene and public sanitation habits

16. Solid waste pollution control * Junk food packaging, litter prevention, recycling plastics, incineration of combustibles for energy production and composting organic waste * Students have a clear purpose in life to have good solid waste disposal habits

17. Politics, economics, technology, and ethics • Influencing political policies, environmental social ethic and career plans • Students develop a powerful positive responsibility action record in the areas of ethics action and political action

18. Toward a sustainable future • Developing environmentally sound life styles, developing more alternative renewable resources and recycling all resources • Students develop a powerful positive responsibility action record toward a sustainable future for the Earth

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Linking the Economy and the Environment Preserving and Restoring Native Prairie Habitats—An EE Partnership Success Story

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Background

Partnerships grow and blossom when given an atmosphere in which they can flourish. Eden Prairie High School in Eden Prairie, Minnesota and the Minnesota Valley National Wildlife Refuge have worked together on a wide variety of environmental education projects over the last 4 years. A formal partnership agreement in 1991 solidified and added momentum to this working relationship. The "Put the Prairie Back in Eden" project built on this foundation. The number of partners was expanded and the project, a cooperative venture to restore native prairie to a site off a major state highway in Eden Prairie, was of greater magnitude than any that had previously been attempted. Conservation Biology classes at Eden Prairie High School initiated the project. Unlike typical high school science classes, the textbook was exchanged for hands on learning and real-life involvement. Students were given the task of working with a diversity of partners in designing a plan to restore a 70 acre plot to native prairie.

An adjunct committee of the City Parks Commission made up of students, teachers, city employees, Refuge staff and private citizens was established in order to identify the boundaries for the project. Committee members met on a regular basis and were responsible for contacting other potential partners. Students made a presentation to representatives of the Metropolitan Airport Commission (MAC) and Browning Ferris Industries (BFI) and won support for their restoration proposal. In 1991 the project received a $10,000 challenge grant from the U.S. Fish & Wildlife Service and in-kind services from other cooperators. During the 1992-93 school year Conservation Biology students, with assistance from Minnesota Valley National Wildlife Refuge, developed a preliminary management plan and interpretive master plan for the area. Students and representatives from the cooperating organizations also participated in the initial site clean-up and preparation.

Current Status of Project

The project is ongoing. Some aspects of the program do not coincide well with the academic calendar, thus affecting student involvement to some degree and limiting the ability of some students to experience the closure of a completed project. In many ways however, this longitude is a benefit. More students are given the chance to take part when the project is broken down into a series of steps. While this is sound from an educational standpoint, it is also a logistical necessity. The complexity of coordinating the efforts of the various partners results in slow but steady progress. The 1993-94 students are preparing to implement the recommendations of the management plans developed by preceding classes. Efforts are underway to collect seeds, grow seeds, and organize major site preparation efforts next spring.

The Value of Partnerships

While philosophical differences and logistical problems are often barriers to successful partnerships, the benefits of such ventures far outweigh the drawbacks. Far greater gains can be made by employing the synergy of a joint effort than could ever be made working alone. Students fortunate enough to be involved in this process get a first hand lesson in "real life" and the experience that positive things can be accomplished when seemingly diverse groups work together toward a collective good.

Project Eagle Watch

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Introduction

One of the greatest gifts a teacher can give is a sense of wonder about the local environment and the ability to "look up and understand". Project Eagle Watch has enabled seventh grade students at the Polson Middle School to do these things...look up, wonder and understand.

Project Eagle Watch began in 1984 when I had the opportunity to work as a volunteer counting bald eagles as they gathered in large numbers in Glacier National Park in Northwestern Montana where the birds were feeding on spawning on kokanee salmon. The original project involved local 7th grade students who marked locations of bald eagles on a country map. During the years that followed. Project Eagle Watch developed into a six-month project which incorporated three essential steps in "real-world" wildlife biology: data gathering, data processing and report writing.

Polson is located in Northwestern Montana on the southern tip of Flathead Lake, the largest natural freshwater lake west of the Mississippi. The headwaters of the Flathead watershed are the mountains of British Columbia, Glacier National Park and the Bob Marshall Wilderness. Water leaving the lake in the Flathead River eventually flows into the Columbia River Basin.

Polson is the county seat of Lake County. Besides tourism and recreation, the major industries of the area are agriculture and wood products. Lake County and Polson area, in particular, is known for the delicious sweet cherries grown here.

The Confederated Salish-Kootenai Tribes live on a reservation located within a part of Lake County. They cooperatively manage the fish and wildlife on the reservation with the State of Montana and they created the Mission Mountain Tribal Wilderness Area. The Missions form the backdrop for the Flathead valley and in the process of granting wilderness status to this range, the Tribes protected the splendor of the mountains as well as pristine wildlife habitat. As is the case with other Native Americans, the eagle is an important spiritual link for the Salish-Kootenai people.

Lake County has a tremendous variety of wildlife ranging from many species of waterfowl that nest on glacial potholes to grizzly bears and wolves which utilize the Mission Mountain peaks and foothills. Four national wildlife refuges are located within Lake County's borders.

Lake County has experienced rapid growth as people move into the area and settle as either permanent or seasonal residents. Much of this development is occurring along the Flathead Lake, as well as the foothills of the Mission Mountains. The bald eagles observed during Project Eagle Watch frequent the shorelines of the Flathead Lake and River as well as the wetlands associated with the national wildlife refuges in the area. They may use the foothill areas as roosting sites. The effects of human development and activity upon the wintering bald eagles is unknown.

Data Gathering

Project Eagle Watch begins October 1 as students watch for migrating bald eagles moving along a north-south travel corridor from Canada to the Pacific Northwest and Rocky Mountain States. Previous instruction has equipped them to identify not only adult and subadult bald eagles, but also both age classes of golden eagles which are found in this area.

Student observations of eagles occur while they travel to and from school or while engaged in other activities on their own time. When students observe an eagle, they return to the classroom and mark the location on a county map with a pin. Adult and subadult locations are represented by red and blue pins respectively. Students record the date, temperature, and the number of eagles seen on a data sheet. They also indicate the bird's specific location by deterring the township, range and section. Finally, using the map scale, they measure the nearest distance to water. The data gathering phase of the project continues through January 31.

In order to begin an activity similar to Project Eagle Watch in your classroom, you must first select the organism you students will observe. While it has been exciting to have the opportunity to study the endangered bald eagle, it is important to realize that this type of project can be done with any organism which my be present in your part of the world. For example, your students could plot the locations of cardinals in an urban neighborhood. Don't overlook plants as a possible subject, especially in the lower elementary grades. Plants are easier to observe since they are stationary, yet some of the same skills of observation needed to differentiate animal species are required for plants.

Once you choose your subject, then make or obtain a map of the area you plan to survey. Purchase various colored pins or other materials to mark the location of the subject and create an appropriate data sheet.

Data Processing

Working cooperatively in groups of 3-4, students perform simple statistical analysis on the four months of raw date which they have collected. They also compare their data to that collected during previous years. They are encouraged to "find the story the numbers are telling" as they calculate mean temperatures and distances to water, average numbers of eagles seen per month, ratios of adults to subadults, ranges of temperatures and distances to water. Simple spread sheet programs give the students experience inputting and "crunching" data which is eventually displayed in various types of graphs.

Report Writing

A written report, done cooperatively by the student groups, summarizes the data and gives the students experience in writing "the story the numbers were telling". The report also includes discussions of the eagles' endangered status, the importance of their winter habitat, descriptions of the habitat and possible threats to the eagles and/or their habitat.

Role-Playing

An appropriate finale to Project Eagle Watch is the simulation of land-use public hearing involving the effects of human development on wintering bald eagles. Since the bald eagle is an endangered species, it is not inconceivable that such a meeting could occur in Polson. The students research and play the roles of the many people who would be involved. A partial list of roles include the following: subdividers, real estate personnel, local land owners, farmers, ranchers, birdwatchers, wildlife biologists, game wardens, representatives of the Salish-Kootenai cultural committee, state representatives, fishermen and finally, the land-use planning board who listens to the comments of all these people and renders a decision. This type of role-playing is a powerful teaching strategy which introduces the students to the importance of public involvement in land use decisions. They quickly realize that management issues are very complicated and real solutions do not come easily.

Summary

Project Eagle Watch develops and understand of the bald eagle and its habitat within the mind and maybe even in the heart of the student. As an interdisciplinary activity, it combines civics, social studies, speech, debate, math and language arts with science. The relationship of all these integral skills is something students often fail to realize before becoming involved in this activity.

At first glance, it would appear that Project Eagle Watch is mainly suitable for middle school students, but this project can easily be adjusted for high school science classes by including more advanced habitat analysis and statistical evaluations of the date. This activity can also be utilized in the primary grades by eliminating the statistics and concentrating on the basic math and map-making skills. Mapping the school yard and finding a location on that map is quite a challenge for your minds. Counting the robins seen in the school yard over a period of time, and adding up the total robins seen may be enough for some elementary grades.

Professional wildlife biologists often need volunteers to help with field observations and teachers frequently require an excuse to get away from weekend paper correcting. A symbiotic relationship between these two types of professionals can be developed which allows the teacher to get into the field and become involved in actual wildlife research. This field experience can translate into "real world" projects in the classroom and gives the students an opportunity to see the teacher involved in something besides instruction. Teachers interested in natural history need to be encouraged to become acquainted with local biologists. Perhaps other unique classroom projects, like Project Eagle Watch, can be developed from their field experiences.

Project Eagle Watch is a locally developed project which takes advantage of a seasonal movement of bald eagles through Lake County. Because the students know the eagles could fly right over the school yard, and they have, the interest in the activity is high. Parents and siblings of my students often join in the activity. Their excitement matches that of the students as they report the location of an eagle. As interest grows, so does the desire to observe. This, in the end, may be the most enduring result of Project Eagles Watch. The ability and desire to observe is a skill which will serve the students well for a lifetime.

Environment, Science and Children--Are We Ready for Darwin?

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The book by the North American Association for Environmental Education, *Essentials Learnings in Environmental Education*, is a listing of 600 environmental education concepts. The author will take the sagacious advice of Thoreau when he said, "Our life is frittered away by detail... simplify, simplify." The writer has condensed the science concepts of environmental education to four primary concepts and they all demand students to understand evolutionary ideas. To understand the "big four concepts" and their ramifications will allow environmental education to produce citizen ecologist who are lasting in the ecological movement rather than instant ecologists who practice ecological behaviors because the practices are in vogue. We will look at the four concepts, their importance to understanding of the environment in relationships to human behavior and some ways to teach the concepts so that students will act in accordance with their knowledge.

The Evolution Concept

> *Life on the planet and the physical environment of the planet have evolved together and maintain each other.*

The physical environment, including oxygen, carbon dioxide, and heat, maintains life on the earth. Life maintains the stability and the constancy of the physical environment and the systems evolved together. Evolution, adaptation, and ecological interdependence are one and the same concept as they concern survival in nature. Understanding evolution not only lets us understand how we got here but how we can stay here.

A fascinating concept, evolution is shortchanged in the curricula of our schools. Adolescent students learn that bacteria evolved over time to become elephants and great whales. It is through evolution that yuccas and moths are mutually dependent and it is through evolution that bacteria live in our large intestine and we regularly have gas in our stomachs. Evolution wedded these relationships.

The concrete experiences that develop the background to understand evolution should begin in elementary school. Children should appreciate the 4,500 million year old Earth. Similarly, children should know how the age of the Egyptian Pyramids or the age of the United States relates to the age of the Earth and geological time.

Use a 50 meter adding machine tape and let the students discover a unit of length to equal a million years. Let them draw the eras and periods along the line. They will be startled to know that the Ice Age didn't begin until one centimeter from the end of the tape. It was only two centimeters from the end of the tape that our species began! They won't even be able to separate the marks that represent the building of the Pyramids and the signing of the Declaration of Independence. If the age of the earth was one full year, 365 days, from January 1 through midnight on December 31, the signing of the Declaration of Independence happened .6 seconds before midnight on December 31!

To understand how natural selection works all students should have the experience of picking up colored toothpicks from a green lawn. The author paints the green toothpicks to the match color of the grass. Use equal numbers of each color. Each student is challenged to pick up as many toothpicks as he or she can in 20 seconds. Students record the total number of toothpicks and the numbers of each color they pick up. Sometimes the green toothpicks will number less than one twentieth of the numbers of white, yellow or red. In the game of predation it would be the greens left on the lawn that would do the reproducing. A gene code is naturally selected. The same phenomenon is at work in nature day in and day out and it has been going on for millions of years: in animal coloring, physiology, anatomy and behavior. Evolution has caused millions of species of organisms to live on the earth. By changing the habitats of the organisms, we humans are causing extinction of plants and animals at thousands of times the rate of the evolution of new species.

The Ecosystem Concept

Life on Earth operates within ecosystems that are nourished in and by the biosphere.

The concept of ecosystems is abstract. An activity that allows students to bridge the idea from the abstract to concrete is to build a sealed aquarium using the following technique. Begin by adding algae; nearly any freshwater algae will do. Sprinkle some soil on the floor of the aquarium and add some duckweed, which will float on the water, some freshwater snails, daphnia and guppies. The aquarium is now ready to be sealed. Add a bead of sealer along the rim of the aquarium. Sealer that is used to mend leaky aquaria works well. Add a plate of clear glass over the top to prevent outside air from entering the system. Ask the students to predict what may happen to the living things in the aquarium. Younger students with little biology background will predict that the animals will die because they "can't breathe." But when this doesn't happen, they will ask why. They discover the ecosystem concept. Then place a black cloth over the aquarium and ask how it will effect the organisms of the aquarium. It won't be necessary to leave the cloth on the aquarium for the students to know what will happen if they have experimented to see that light is necessary for plants to grow.

Understanding how ecosystems function allows students to understand biodegrading, sewage treatment systems, biomass for an energy source and how coal and other fossil fuels contain energy that was not completely recycled by earth's own recycling systems.

The Energy Concept

A limited supply of the sun's energy is stored in the chemical bonds of living and once living organisms. However, alternative energy sources are available.

Students must learn that when the fossil fuel reserves are gone, we will be forced to rely upon other sources of energy. They should learn that we are burning fossil fuels many thousands of times faster than they accumulate in the Earth's crust. For the concrete thinkers who are just beginning energy study, have them watch a piece of coal burning over a Bunsen burner. Switch off the lights and explain that the sun's energy is lighting the room. Tell them that energy was trapped millions of years ago by plants and that today we use that energy to make our society run and to make many of the goods we use in our lives. Ask students how we may use energy minerals of the earth's crust so that future generations can meet their needs. Here is a good place to carry out the Pringle's activity. The processing of the potatoes and the packaging of the chips in this product is unconscionably wasteful of energy and minerals. Students determine the calories consumed in making the polished paper, the steel bottom of the can, the aluminum lid, the nonrecyclable aluminum lining of the container and plastic that surrounds the two containers when they are on sale. They determine that many more calories are used to produce the packaging than are contained in the chips themselves.

The Population Concept

Populations do not reach their biotic potentials.

This is probably the most important environmental concept one can teach and it is tied integrally to evolution. Each species has the potential to overpopulate. We have removed the checks from the human population. To ignore the consequences of unchecked population growth will mean the destruction of Earth as we inherited it at the end of the Pleistocene.

Students may see how populations expand by raising domesticated earthworms. Use a worm by the trade name "red wiggler" which can be purchased from advertisers in sporting magazines such as *Field and Stream*. Start a culture with three or four worms in a quart-sized container like a cottage cheese container. They grow well in a one to one mixture of peat moss and rich garden soil. A good diet for the worms is a breakfast food like Cream of Wheat that is sprinkled on the moist surface of the soil once weekly. A moist cloth is placed over the surface and the worms are left in a cool location to grow and reproduce. Approximately every two weeks the students should count the worms and measure the average length. They will see the population peak at more than a thousand and then fall until the last worm dies. They spoil their environment. Despite a constant supply of food and water, the quality of their environment depreciates because of overpopulation. We hope the students can extrapolate the experience and realize that the earth has a carrying capacity for humans too.

Though we are subject to the great forces of change that have randomly steered our own evolution, we are now part of those forces. By our ability to cause major changes in the environments of Earth's communities, and the biosphere itself, we have our hands on the controls of evolution—for a while. Are we ready for Darwin?

The Statewide Integrated Conservation Education Program (SICEP)

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The Wyoming Conservation Connection is a unique unit within the University of Wyoming. Receiving most of its funding from outside the University, the Conservation Connection serves the teachers of Wyoming by providing a link between the University, resource management agencies, and quality conservation and environmental education programs with the goal of providing superior educational opportunities in our schools. The Conservation Connection works with many agencies at the local, state, and federal level who have, as part of their overall mission, public education about maintaining a healthy environment. Some of the important sponsoring members of the Conservation Connection include: Wyoming Game and Fish Department, Bureau of

Land Management, U.S. Forest Service, Wyoming State Forestry Division, U.S. Soil Conservation Service, many local conservation districts, businesses, and individuals.

Through the Conservation Connection, teachers gain hands-on experience with outstanding programs developed for educating our youth about the natural world and our relationship to it. Nationally and internationally recognized programs such as *Project WILD*, *Project Learning Tree*, and *Agriculture in the Classroom* are taught at workshops coordinated by the Conservation Connection.

The Conservation Connection also develops new curriculum materials. Among these is the *Water, Youth and Optimism (WYO)* water resources education curriculum. This curriculum is being presented to Wyoming teachers in a statewide series of workshops sponsored by the Wyoming Game and Fish Department during the 1992-93 and 1993-94 school years. These workshops give teachers training and experience in using the *WYO* curriculum, *Aquatic Project WILD*, and National Geographic materials. By the end of the current school year over 300 teachers will have attended these workshops.

Natural Science Workshops for teachers, held in the summertime, have been sponsored by the Conservation Connection since 1987. Representatives of land and wildlife resource agencies who sponsor particular curriculums, resource agency personnel involved with environmental education, and other natural science educators combine as a teaching team at each of the workshops. Held at regionally located sites around the state that are noted for their exposure to Wyoming's spectacular natural resources: mountains and forests, unique geology, pristine streams, and native wildlife, the inspiration to learn about our resources is provided by the location. In 1993 the three-day summer workshops were held at Ranch "A" in the Black Hills near Sundance, Twin Lakes Lodge in Whiskey Basin near Dubois, Medicine Bow Guest Ranch near Saratoga, and Grand Targhee Lodge on the west side of the Tetons. Sessions on more than thirty subjects and curriculum programs concerning natural science and sustainable resource use were offered this past summer taught by fifty representatives of resource agencies, colleges, businesses, farms and ranches, school districts, and the University of Wyoming.

A sampling of the sessions offered and their sponsors includes: Reclamation in Wyoming, Wyoming DEQ; Alternative Energy Activities, University of Wyoming; the Vore Buffalo Jump, UW Extension Service; Encampment River Wilderness Study Area; Project Learning Tree, U.S. Forest Service; Project Wild, Wyoming Game and Fish Department; Geology, BLM; Zero Population Activities; Knowing the Native Plants, Wyoming DEQ; and many more.

All of the 150 teachers, representing grades kindergarten through 12th grade will return to their classrooms with new ideas, new curriculum materials, and new knowledge to aid in planning field trips, and teaching about natural science, Wyoming's Resources, and living sustainable life styles.

Among the programs sponsored and developed through the Wyoming Conservation Connection, an exciting new program presently under development has the potential to have the greatest impact on our teaching for understanding stewardship of natural resources and sustainability. That program is the Statewide Integrated Conservation Education Program (SICEP). With a continuing grant from Eisenhower Math and Science Improvement Funds, the SICEP program, which has been named *Wild Wonderful Wyoming: Choices for the Future*, will integrate conservation concepts into all subjects of our schools in grades K-12. *Wild Wonderful Wyoming* is not another class being added to an already bulging school curriculum. The design of the *Wild Wonderful Wyoming* materials is intended to incorporate concepts about sustaining the environment into the school curriculums that are already in place.

Most of the state's forty-nine school districts have joined SICEP. Each of these district's superintendent has selected one or more outstanding teachers from the district to serve as that district's teacher-facilitator. In some cases the teacher-facilitators were selected through a recommendation process and in other cases selection

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was through a competitive interview screening. Each of these teachers not only has an interest in environmental education, they are also among the very best educators in the state. The teacher-facilitators are at the heart of the project, writing and compiling curriculum activities that will go into each of the three large activity manuals written for the elementary, middle, and high school levels.

The model being used in developing *Wild Wonderful Wyoming* is aimed at creating a product that is not only factually and pedagogically correct, but also to produce three attractive manuals that teachers will want to use and find easy to use. This model, in short, is to provide a sound framework in which exemplary teachers can work to produce an outstanding product in terms of both content and usability. No one understands better what teachers need than teachers do, so it makes sense to let teachers have the majority of input in creating "teacher friendly" materials. And once the manuals are completed who will be better qualified to teach how to use the manuals than the teacher-facilitators who helped produce them?

The framework for the curriculum was built using several environmental education reference documents and materials, as well as materials developed in SICEP. The basic wording of the goals was drawn from *Learner Outcomes for Environmental Literacy* (Wyoming Environmental Education Task Force, 1991), and the *Comprehensive Plan for Environmental Education* (Governor's Task Force on Environmental Education 1992):

Goals of the SICEP are to realize a Wyoming High School Graduate who:

Goal A Has a working knowledge of those cross-disciplinary concepts pertaining to the sustainable use of an environment hospitable to the diversity of Earth's species, including man.

Goal B Seeks to expand direct human experience with the natural world to satisfy curiosity about "how things work."

Goal C Understands and values natural systems; comprehends that all life is connected and that before any part of an ecosystem is changed, the impact of the change on the ecosystem and the biosphere must be considered.

Goal D Thinks critically about environmental issues, communicates effectively about them, and is motivated to help resolve them.

Goal E Is committed to the continuing development and application of a sustainable land ethic.

Goal F Will understand what natural resources management is, how and why humans manage natural resources and how this management affects humans. Students will further understand that management decisions are based on human-defined goals, values and needs.

To complete the framework, appropriate concepts were either written or chosen from references such as *Essential Learnings in Environmental Education* (Ballard & Pandya 1990), and listed under each of the goal statements.

Working within this framework, the teacher-facilitators are writing and compiling activities during a series of three two week summer workshops. Then, during the school year, these teachers use the activities in their classrooms and evaluate them. Many of the activities are being borrowed from other excellent programs such as *Project WILD*, *Project Learning Tree*, and *OBIS*, but the finished product will be much more comprehensive than any of these programs is individually. Rather than focusing on wildlife, trees, nature awareness or any other single perspective, *Wild Wonderful Wyoming* takes a complete environmental education approach utilizing the best of other programs as well as including new activities. If not already written to incorporate current pedagogical techniques, these activities are modified into formats that center around discovery learning, the learning cycle, and cooperative learning when appropriate.

Since these manuals are being produced with usability in mind, the teacher-facilitators not only write and compile activities, but also recommend manual designs, page layouts, charts, pictures, titles, graphics, and other information that will enhance "teacher friendliness" in the finished product.

To insure the integrity of the material for content, educational appropriateness, and objective analysis of issues, the project is being overseen by a 15 member editorial board composed of ranchers, school board members, scientists, resource managers, and educators.

After the manuals are completed, they will be distributed to Wyoming teachers through a series of "how to" workshops held at schools throughout the state. The teachers who help write and compile the manuals will be the representatives for the program in their district. As the environmental education leaders in their district, these teachers will be the instructors for the workshops, with assistance from University faculty and resource specialists. These SICEP representatives will be a valuable link for their district between programs, resource agencies, the University, and their district's teachers. There are nearly 7000 teachers in Wyoming, and the plan for SICEP includes involving each of them in this program, giving each teacher a SICEP manual and the training to use it effectively in their classroom.

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ConServe Wyoming

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The Wyoming Outdoor Council (WOC) is a non-profit, membership organization established in 1967 to conserve the natural resources of Wyoming. WOC is the largest statewide conservation group in Wyoming unaffiliated with any national organization. Our mission is to conserve and enhance Wyoming's environment by educating and involving citizens, and by promoting sound natural resource policies.

Since 1987, the Outdoor Council has sponsored a significant program of educational outreach. The goal of our educational effort is to improve environmental literacy--skills, knowledge, and motivation to solve problems--among Wyoming citizens, especially its youth. The program is listed in Renew America's Environmental Success Index. These outreach endeavors consist of:

- ConServe Wyoming, a project which seeks to involve students outdoors in watershed rehabilitation activities, as a form of community service to be directly related to the school curriculum;
- the Conservation Biology Project, a six-year effort to provide training in field study skills and curriculum materials about the basic concepts of biological diversity and climate change for teachers and administrators in Wyoming public schools; and
- a series of weekly radio programs, entitled "Wyoming Outdoors," which are broadcast statewide on Wyoming Public Radio, and subsequently picked up for dissemination on two E-mail networks. Nearly 270 programs have been produced.

The Conservation Biology Project has received a "Take Pride in America" award in 1989 from the U.S. Fish and Wildlife Service. WOC played a central role in founding the Wyoming Association for Environmental Education in 1992.

What's the Problem?

One of the problems we confront is that young people growing up in Wyoming tend to have a very superficial investment in the land that nurtures them. Nearly all of them live under circumstances that afford them only infrequent contact with the abundance of natural resources which surround them. Neither do they have much awareness of the threads that tie their particular community together, the network of ecological relationships and personal commitments that make it function as an integrated unit.

At the same time, there is growing concern in many quarters about the continuing degradation of a number of Wyoming's streams and the associated riparian areas. People connected to agriculture generally agree that, in managing natural resources, the deterioration of our watersheds is an enormous problem.

Consequently, the problems addressed by the project are three-fold:

1. How to give Wyoming youth a "sweat equity" in the natural resources of the area in which they grow up?
2. How to provide insight for young people into the network of relationships--both human and ecological--that make their particular community function as an integrated unit?
3. How to accomplish the rehabilitation of selected stream drainages on a holistic basis?

There is a need here in Wyoming to test the hypothesis that engaging public school students in community service related to a meaningful conservation project, like watershed rehabilitation, will cause them to sink deeper roots into the soil of their home state. As they experience community service, leading to a gradual improvement in the condition of nearby streams, students will be able to assess the value of being involved in purposes larger than their individual goals. In this way, we hope that they will develop a clearer sense of their own identity, and a better understanding of the individual's role in his or her respective community--along with a commitment to making these communities function more effectively.

Goals and Objectives

A. To engage public school students in community service related to natural resource management, at the level of doing:

1. To improve ecological literacy, related to riparian management, among students in grades K-6 and 9-12 involved with the project
2. To develop students' leadership potential, and to provide them with opportunities to exercise this potential
3. To develop and disseminate usable curriculum materials for grades K-6 within cooperating school districts
4. To promote integration of community service and in-classroom activities by teachers and students involved with the project
5. To involve students in a coherent community service project, and to help them internalize that experience, thereby:
    a. enhancing their sense of *connection* to, and appreciation for, their local environment;
    b. giving them an experience of authentic accomplishment; and
    c. stimulating scientific interests that may have future career implications.
6. To increase the capacity for critical thinking about public policy issues related to riparian management among teachers and students involved with the Project.
7. To promote constructive interaction between personnel from school districts and natural resource agencies.

B. To bring about positive changes in watershed management practices, with an emphasis upon innovative techniques of riparian management and reduction of non-point source pollution (*Objectives for this goal will be site-specific.*)

Project Description

ConServe Wyoming, in its effort to promote service-learning in Wyoming, carries responsibility for introducing a national initiative into this state. The project seeks to establish a school-based, service-learning program in four public school districts over the next two years. The central idea is to engage students in a form of community service that is also integrated into the school curriculum. In this case, the vehicle is stream rehabilitation. Students will participate in field work related to watershed restoration, while at the same time they are learning about water education in the classroom. The project benefits from the experience that WOC has gained through its involvement in the rehabilitation of two related drainages near the town of Lander, an undertaking in which students have played an important role. Its program builds around identification of a high-profile, demonstration area on a short reach of stream easily accessible to local schools--an approach to involving young people in stream rehabilitation that has been successful in Lander.

The federal Commission on National and Community Service provided funding last year to plan the project and to develop curriculum materials. The Commission continues to help with some funding. Under contract with the Wyoming Department of Education, responsibility for administering this project will continue to be carried by the Wyoming Outdoor Council.

During Year 2, the project will create school-based, service-learning programs in two Wyoming public school districts. To provide start-up motivation for students, WOC will work with schools to organize "Youth Service Days," a one-day event that gets kids working outdoors under the supervision of natural resource agencies on local conservation projects. We shall use a combination of curriculum materials: some which focus on the cognitive, technical aspects of watershed rehabilitation are pre-existing packets; some which focus on the affective side of service learning--reflective writing, poetry or painting, for example--were created in the Year 1 planning phase of ConServe Wyoming. High school tutors and elementary-age tutees will be brought into contact with each other through the conscious use of a cross-age teaching strategy. Teachers and school children will assist in designing and carrying out baseline studies, erosion analysis, resource management, monitoring of range conditions, environmental mitigation, and water quality monitoring. Then these activities will be creatively integrated into classroom learning by means of a series of modules that help students to internalize the significance of what they are doing. These latter modules emphasize empowerment of students through the strengthening of self-esteem and the development of social skills.

South Florida Water Management District Program

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Introduction

The State of Florida has experienced phenomenal growth in the last four decades, much of it in south Florida. The current population of the state exceeds 13 million residents; nearly five million of them reside in the South Florida Water Management District (SFWMD). Additionally, over 40 million tourists flock to Florida each year to partake of the sunshine, beaches, attractions and recreational opportunities.

The SFWMD sprawls over an 18,000 square mile area extending from Orlando to Key West, and Fort Myers to Fort Pierce. Hydrologically, the area comprises the Kissimmee-Okeechobee-Everglades watershed.

In response to flooding caused by a hurricane in 1947, the United States Congress authorized the Central and Southern Florida Flood Control Project in 1948. The next year, the Florida Legislature created the Central and Southern Florida Flood Control District (FCD) to act as the local sponsor for this federally authorized project.

By the early 1970s, Florida's population had grown to the point where water quantity and quality issues, for both people and the environment, began to demand as much attention from water resource professionals as flood control. With the passage of the Florida Water Resources Act of 1972, the Florida Legislature divided the state up into five major hydrological basins. The responsibility for managing the water resources in these basins is charged to the five water management districts of Florida.

The Mission of the SFWMD is to manage water and related resources for the benefit of the public and in keeping with the needs of the region. Key elements of the Mission are environmental protection and enhancement, water supply, flood control, and water quality protection. The District recognizes and understands that a knowledgeable citizenry is better equipped to take responsible action on behalf of Florida's water resources. Its commitment to public information and education has many elements. This paper will focus on the teacher and youth education programs the District provides to the formal education system.

Environmental Education in Florida

Florida has had an environmental education program since the late 1940s. It was during this era that people began to recognize that decades of flood control and drainage, coupled with natural cycles of drought, set the stage for devastating wildfires in the Everglades. Everglades National Park was created during this period and Marjory Stoneman Douglas wrote Everglades: River of Grass.

Environmental educators recognize 1970 as a bench mark year. The National Environmental Policy Act of 1969 was approved, the Environmental Protection Agency was created, the Clean Air Act was passed, and the first Earth Day was held on April 22. In Florida, the State Legislature passed the first Environmental Education Act (with responsibility for implementation largely restricted to the Florida Department of Education) and channelization of the Kissimmee River (draining nearly 50,000 acres of wetlands) was nearly complete.

Florida's environmental education program ebbed and flowed with the political tides of the 1970s and 1980s, ironically hitting bottom in 1985, the same year the Florida Legislature passed the Growth Management Act in an effort to manage the environmental effects of a net daily growth of nearly 900 citizens. A zero appropriation for the Department of Education environmental education program in 1985 generated widespread enthusiasm among various state resource agencies for assuming some of the responsibility for developing and disseminating instructional materials to schools.

Core Program Development

Since its inception, the FCD/SFWMD has been involved in public education about water resources. With a per person per day water consumption of nearly 200 gallons, the need for water resource education is evident. The South Florida Water Management District initiated the development of specific school instructional materials to aid educators in teaching about water resources on a local and regional level.

The first instructional unit developed by the District, "Water for South Florida," was targeted for middle school students and teachers. This 16-page student booklet and accompanying teachers' guide were initially distributed during the 1986-87 school year to the 16 school districts within the jurisdiction of the SFWMD. Teacher education workshops were conducted on a limited basis to support the instructional materials.

The positive response by the education community to this first attempt by the District at providing formal water resource instructional materials led to the issuance of a request for proposals to expand the middle school unit and the development of new units for the elementary and high school levels.

The District's "core" environmental education program now consists of three levels of instructional materials, each with a consumable student booklet, teachers' guide and companion video program.

"WATER FOR US ALL" is typically being used in 3rd grade. Freddy the alligator, the SFWMD mascot, guides students through the water cycle and takes them on a tour of south Florida's "Water Wonderland." A visit to the "O'Guzzler" family home teaches students important lessons about water conservation.

In "WATER FOR SOUTH FLORIDA," Freddy whisks 6th grade students away on a more in-depth, guided field trip through south Florida's watery ecosystems. Freddy gives the kids a tour of a wastewater treatment plant and teaches them how to save water.

"HOW MUCH...HOW GOOD? THE STORY OF SOUTH FLORIDA'S WATER" uses Lake Okeechobee and the Kissimmee-Everglades ecosystem as its primary focus. This supplementary high school-level program is appropriate for courses which examine socio-economic, political, scientific and environmental dilemmas facing south Florida and its water resources.

The distribution of more than 175,000 instructional units is cumbersome and requires close coordination with school district environmental education coordinators. A shipping contractor is hired to handle all aspects of the distribution in an effort expedite and improve the efficiency of delivery.

Each set of instructional materials is keyed to Florida Department of Education Student Performance Standards. Although the District has received a great deal of positive feedback from educators about the instructional materials, no formal evaluation of their effectiveness has been conducted. The District will be contracting for an independent evaluation of its core environmental education program, and a needs assessment, in the coming year.

A comprehensive teacher education program was initiated in 1992. To date, trained workshop facilitators have provided two-day workshops for approximately 650 teachers across the 16-county jurisdiction of the SFWMD. An additional 300 teachers are targeted to be trained during this calendar year. The District believes that teachers who received an in-depth exposure to water resource issues and instructional materials will do a better job of teaching their students about water resources. The effectiveness of the teacher education program is also being evaluated this year.

Supplemental Cost-Sharing Programs

In 1991, the District issued guidelines for the support of supplemental cost-sharing water resource education programs. Proposals are requested annually and are evaluated by a committee selected from within the agency. At the end of the current proposal cycle, over $900,000 will have been spent in support of 16 projects ranging from a residential fresh water studies program in the Florida Keys for middle school students to an adult and community education program on non-point source pollution in a small west coast watershed. Other projects in this popular program include model teaching videotapes and a training program for elementary and middle school teachers in a large, urban, coastal county; a local seventh grade fresh water studies program to accompany the District's middle school unit; and, a water quality monitoring and watershed enhancement program to list a few.

Conclusion

In the last few years, the District's supplementary instructional materials have been introduced to thousands of school students in south Florida. Hundreds of teachers have been trained through the teacher workshop program. Although objective data does not currently exist to support the relative effectiveness of this effort, informal evaluation leads District staff to believe more time is being devoted to teaching about local and regional water resource issues. Teachers who receive specialized training in water resource issues seem better prepared and motivated to teach their students about water resources. The long term result is likely to be a better educated citizenry which is motivated to behave more responsibly toward south Florida's water resources. The supplemental cost-sharing program has allowed the District to support, and participate in, creative water resource education projects which utilize the staff, talents and resources of other agencies and organizations to serve a cross-section of the south Florida community.

Hypermedia, the Diversification of Science Practice and the Environment

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Introduction

Science is both a body of knowledge and a community of individuals with different interests, abilities, experiences and ambitions. Recognized as a community of practice, it is enriched by the diversity of ideas and cognitive styles of each of its members. Hypermedia-based science education software can enhance this diversity, by increasing student interest in science, particularly among women and minorities. Because hypermedia can accommodate different learning styles, it can appeal to students often alienated by instructional approaches that privilege one learning style over another. Increasing diversity in the scientific community may have positive implications for the environment by changing the direction of scientific research and by eliminating "biases against the environment" in research.

Hypermedia

Hypermedia is a nonlinear and nonsequential representation of information in a multimedia environment that may include text, graphics, video, audio, and animation. In hypermedia, information is organized in individual nodes that are "electronically linked according to the creator's cognitive map and randomly accessed in response to a user's mental associations" (Vandergrift, 1988). A student can navigate through a hypermedia program in any number of different directions depending on his or her interest, inclination and learning style. Thus, hypermedia has potential advantages for science education ranging from more effective ways to present information, to affective and cognitive aspects of learning (Marsh & Kumar, 1992).

Hypermedia is ideal for building systems for the physical delivery and management of irregularly structured information. It is this quality that makes hypermedia suitable for a variety of scientific applications (Marsh & Kumar, 1992), including concepts related to the study of ecosystems and the complex interactions of science, technology and society (STS). A student can gain a multidimensional perspective of an issue like acid rain, for example, by navigating a hypermedia application replete with concepts and issues, newspaper clippings, court cases, expert opinions, and video segments of damaged forests (Kumar, 1991).

Authoring Tools

Authoring tools are software packages that enable the user to create hypermedia applications without having to know how to program. HyperCard for Macintosh computers, for example, is the most widely used commercially available authoring tool. It is easy to use, and is considered to be a new tool for teachers to develop their own customized instructional materials (Lynch, 1990). In this way, authoring tools can help teachers overcome the chronic problem of educational software that does not meet the teachers' needs or those of their students.

Students in some science classes have created their own hypermedia applications, and in their hands authoring tools promote the construction of students' knowledge by creating new opportunities for their active engagement in learning within the structured environment of the classroom and the software (Bohren, 1993; Freitag & Abegg, 1991). The educational benefit of developing a hypermedia document is exemplified in a study of Intermedia, a hypermedia system developed at Brown University: It was found that "the teaching staff producing Intermedia packages benefitted from the medium's nonlinea[r]ity rather more than the students did; they developed more pluralistic views of their subject as a consequence of developing the teaching materials"

(McConnell, 1991). The use of an authoring tool can challenge students to organize and represent their knowledge of the material, and to make the many connections between interrelated ideas and issues.

The Female and Minority Student

Research and experience have shown that when students use an authoring tool to create their own applications, they feel they "own their knowledge" and become very conscious of "getting it right" (Rye, 1993). Students can create their applications in their preferred learning styles by linking ideas, data and information they have researched themselves by using such sources as their classroom activities, laboratory work, readings on the history of scientific concepts, newspaper clippings of local controversies, expert opinions and interviews, and family anecdotes and histories, to name just a few examples. Students can use the culturally and contextually familiar materials from their own lives and neighborhoods in a way that is meaningful to them and can hold their attention. In this way, students create applications that "look like them," in other words, that reflect their cognitive and cultural traits (Lincoln, 1993). This approach has been successful with female, minority and at-risk students (Bohren, 1993; Lincoln, 1993).

The Cultural Dimensions of Educational Computing

Most discussions on educational computing focus on the practical and technical problems teachers need to solve to integrate computers successfully into their classrooms. Less often, discussions cover the political and ideological content of the software (e.g., how are the issues of forest preservation and timber interests presented?) and concerns of student access to computers (e.g., does educational computing reinforce prevailing patterns of social inequity?). Rohwedder includes the environmental impact of educational computing as an issue (1990). Only occasionally, however, is it acknowledged that computers, like all technology, are not neutral tools (Rohwedder, 1990), as they mediate the form of life of the social institutions in which they are introduced. This has particular significance for environmental educators, because educational computing, through the way it mediates our form of life, may well be implicated in our environmental crisis as well.

While computers have a significant contribution to make to the understanding and resolution of environmental problems, we face the paradox that the use of computers, especially in education, can reinforce the worldview or mindset that has "contributed to the disproportionate impact that Western societies have had on degrading the habitat" (Bowers, 1990). The mechanistic view of nature, the anthropocentrism that regards nature as a resource for human aspirations, the focus on the individual as an autonomous knowing subject independent of his or her surroundings, and the belief in the progressive nature of change are all elements of Western culture that have come under scrutiny in the latter half of the twentieth century. Our beliefs, values, economic practices, political processes and social organization, in short all of our social institutions, are built on these cultural foundations, and can be directly connected to environmental degradation, population growth, rainforest and habitat destruction, the creation and disposal of hazardous and nuclear wastes, and the weakening of global support systems (Bowers, 1990). By focusing on environmental problems as problems of data and scientific uncertainty that require the power of the computer for resolution, it is possible to neglect, or deny, the cultural aspects of environmental problems. And by failing to acknowledge the metaphorical nature of language, it is difficult to recognize the process of cultural transmission embedded in the computer and its software (Bowers, 1988).

Increasing Diversity

It is often argued that hypermedia is a tool to increase student interest in science, particularly among women and minorities, because hypermedia can accommodate a diversity of learning styles and provides a rich, multimedia learning environment. What happens to science when the community of scientists becomes culturally and cognitively more diverse? For one, different groups tend to have different interests (women, for example, historically have pursued careers in the biological sciences), and we may find that interest in environmental science increases with this growing diversity. For example, in a special issue of Science magazine devoted to minorities in science, it is claimed that Native Americans "are figuring out how to bridge the gap between their native traditions and science, [and] are much more likely than whites to be environmental and life scientists" (Levy, 1992).

The environmental implications of increasing diversity in the scientific community may be analogous to what has happened to research in the biological sciences with increasing numbers of female scientists: previously unrecognized gender biases have been identified in some research, including bias in the choice of research projects, in the money invested in different areas of research, and in flawed methodologies (Rosser, 1990). Similarly, it may be said that "biases against the environment" exist in some scientific research including projects supported by agribusiness, international development organizations (Woodley, 1991), and the U.S. Congress, which promoted systems ecology in the 1960s as a means for greater control of nature (Kwa, 1987). Some people have argued that these biases (anthropocentrism, the control of nature, the privileging of frequently unsustainable, scientific knowledge over sustainable, indigenous knowledge, etc.) are in fact gender biases, and propose a new de-gendered epistemology of science that would result in less environmental degradation (Merchant, 1989).

One goal of science education reform is to attract students to careers in science to meet the needs of an increasingly technical workplace; the changing demographics of the workforce alone warrant the emphasis on attracting women and minorities (Healy, 1992). Increasing diversity is also warranted for reasons of social justice: In the US, we believe that everyone has a right to equal opportunity. "As more people from differing races, classes, ethnic backgrounds, and genders become scientists, the science they evolve will be reflective of their rich diversity of perspective" (Rosser, 1990). At a minimum, there will be more research in the environmental sciences. More importantly, since it is generally recognized that increasing diversity in any community raises a challenge to received opinions, science may begin to move beyond an anthropocentric, mechanistic interpretation of nature.

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Integrating Interdisciplinary Outcome-Based EE into the K-12 System

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The State of Minnesota passed an Environmental Education Act in 1990 that required the Department of Education to encourage all school districts to teach environmental education, and required environmental education to be integrated into the curriculum using outcome-based methods.

In 1991 the Minnesota Department of Education received moneys from the Natural Resource Trust Find, a beneficiary of the Minnesota Lottery, to develop a kindergarten-through-twelve integrated, outcome-based environmental education model program. From 50 applicants the Department chose seven school districts and on 8-district consortium as research and development sites for this project.

The publication that was produced from their work, Addendum: Greenprint for Minnesota Schools: A Guide for Integrating Environmental Education is a synthesis of their efforts carried out from 1991 to 1993. The guide provides teachers the methods to integrate environmental education into their curriculum and contains model teaching units from each participating school district that demonstrate the recommendation of the guide.

Results of the Research and Development Work

- produced over 100 teaching units that incorporate, in some way, outcome-based, integrated, environmental education. Most of these units are or will be available for use by teachers statewide
- developed two options for integrating environmental education into the curriculum
- identified strategies for team-teaching that seem to work best, especially for use as an introduction to integration
- identified effective curriculum development processes for districts
- developed dissemination methods both within and between districts
- developed unique options in choices of themes, structuring class hours, community partners, and action projects
- became a team that is willing to help share these results with other districts.

Conclusions of the Participating Districts

The teachers who developed the model curriculum integration process found that by using environmental education as an organizer for their other subject material, the process:

1. identified connections and expansions, linking learning together into a relevant whole
2. required students to use higher level thinking skills
3. empowered students to deal with issues in their own lives
4. promoted global awareness and identified local actions that can be applied to global issues
5. promoted action on issues

Relationship to the Proposed Minnesota Graduation Rule and Concept Frameworks

While this project was in progress, Minnesota's proposed new graduation rule was developed. The rule consists of a set of outcomes each Minnesota graduate will be expected to meet. Several of the proposed graduation outcomes directly require environmental education and the others can easily be addressed using environmental education content and methodology. During the course of this project, all six comprehensive outcomes and all thirteen of the content outcomes were addressed, even though unwittingly since the outcomes had not as yet been written. The results that the teachers noted and the relationship of what they did to the graduation outcomes came about in large part because of the well-established tradition in Minnesota that:

- there are four contexts to environmental education, natural, social, valuing and action. Environmental education cannot be reduced to science education

- environmental education must address the seven goals identified in the 1990 Environmental Education Act, most of which were adopted by the Board of Education and became graduation outcomes

A framework of environmental education concepts that is developmentally appropriate for kindergarten to twelfth grade to be used as a guide by teachers planning their curriculum was drafted in the summer of 1993 and should be available in final form sometime in 1994. It was written by one of the districts involved in developing the model environmental education curriculum integration process at the request of the Department of Education.

The Model Environmental Education Curriculum Project

This research and development project was an extraordinarily demanding challenge. It required the schools to carry out at least three very exacting tasks simultaneously to:

1. teach environmental education. Few teachers have any in-depth formal instruction in environmental education
2. integrate subject matter. Integration is difficult because most academic training is acquired in discrete disciplines
3. teach using outcome-based-philosophy and methodology. Teachers in Minnesota are still in the process of learning and applying these methodologies. Levels of understanding vary widely throughout the state.

Curriculum Integration Process

The integration process outlined here and explained in the guide is a combination of the outcome-based principles, the experiences of the districts that participated in the integrated curriculum development project, and the incorporation of the proposed graduation outcomes and concept frameworks.

Summary Outline

In Minnesota, integrating environmental education district-wide includes the following elements:

1. Use the proposed environmental education graduation content outcomes as the goal for the district's efforts. That outcome is The Minnesota graduate understands stewardship for the environment.

2. Choose attributes and check points or indicators appropriate to grade levels from the environmental education curriculum concept framework so that the units expanded or written are developmentally appropriate.

3. Insert the attributes and check points into the district's curriculum. Step three suggests at least two options:

   A. Expand units currently taught to include environmental education outcomes and assessments.

   B. Adopt an environmental education theme. Construct units on that theme that include other subjects or graduation outcomes in the district's scope and sequence, and create outcomes and assessments for environmental education and those other subjects.

4. Choose integration methods. Developers of individual units decide how or if they will work with other teachers to achieve the outcomes for each grade level.

5. Write new units or augment existing units, including lessons.

6. Pilot-test the units and revise as needed.

District Implementation

The process requires:

- identification of a team leader to coordinate, monitor, and collect and compile products
- identification of a management team
- incentives for participation on a writing team
- selection of a writing team
- provision of basic information by means of workshops for the writing team on

  a. outcome-based methods
  b. environmental education concepts
  c. integration methods
  d. graduation outcomes and concept frameworks

- provision of in-service time for writers to create a first draft of their teaching unit or course
- provision of a standardized form for units/courses/activities to be written or adapted
- on-site support for the writing team

  a. supplementary materials
  b. someone to answer questions

- trial testing of teaching units/courses and collection of data for refinement
- networking time for developers to discuss progress and problems
- in-service time for developers to refine their units
- dissemination of the project to the district, other districts, and the Department of Education
- on-going monitoring of the work from year to year.

Current Status of Efforts to Integrate Outcome-based Environmental Education into the Minnesota School Curriculum

In the spring of 1993 the Minnesota Legislature endorsed the concept of outcome-based education and the graduation outcomes for all Minnesota public schools and appropriated ten million dollars over the next biennium to implement the change. The content of the outcomes is to be finalized during the 1994 legislative session and the teaching methodology to be in operation by 1996. The legislative challenge for those interested in environmental education is to ensure that the two to three outcomes that directly require environmental education remain in the list.

The legislature also appropriated 60 thousand dollars for fiscal 1994 directly for the implementation of the results of this project. Much of that work will be in collecting all of the materials written by the districts, seeing that they are in the same format, preparing them to be disseminated to state schools on disk and organizing workshop teams. That work will be carried out in partnership between the Department of Natural Resources and the Department of Education.

The environmental education integration process and the model teaching units developed in this project will be part and parcel of the Departments of Education's statewide effort to install outcome-based education. Indeed, the Department of Education recognizes that the work that these districts have already done has produced processes and material for use on a much broader scale. The giant task now is to reach and effectively implement these in every district in the state over the course of the next ten years.

Using Videotape Vignettes to Teach Problem-Solving Skills in EE

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A multitude of national reports indicate the majority of American students do not understanding basic scientific concepts and can not apply science problem-solving and process skills (e.g., American Association for the Advancement of Science, 1988; National Commission for Excellence in Education, 1983; Study Group of the American Association for the Advancement of Science, 1990). If the youth of today are to lead our society of tomorrow toward happiness and prosperity we must provide them with the necessary cognitive tools to hammer out new ideas, shatter specious arguments and information, and construct informed and intelligent choices.

While there are many reasons for widespread scientific illiteracy, certainly a primary factor is the amount of time students spend on mundane non-thinking tasks such as watching television. It has been estimated that, on average, student graduates from high school have spent 12,000 hours in school and 18,000 hours in front of T.V. (Postman, 1983).

This paper is concerned with utilizing the "power" of the television medium for stimulating, rather than degrading, students' higher-level thinking and conceptual understanding of science both in, and out of, the environmental science classroom. Specific videotape-based vignettes are described which take advantage of the medium's motivational potency to fine tune students' thinking skills and scientific understandings relative to environmental problem solving.

An Instructional Strategy for Higher-Level Information Processing and Conceptual Understanding

Many teachers can't recognize nor can they teach higher-level problem-solving skills and sound conceptual understanding to their students (Holmes Group, 1990; Task Force on the Education of Young Adolescents, 1989; Weiss, 1989).

Research from the cognitive science literature indicates the teaching of problem solving and conceptual understanding requires providing students with science activities that establish and strengthen successful connections between process knowledge and concept knowledge (Anderson, et al., 1990; Derry, 1990; Shuell, 1986). Concept knowledge is built on a foundation of facts, examples, assumptions, analogies, and experiences that are linked and applied (i.e., processed). Process knowledge involves information-processing strategies that create questions, generate predictions, develop hypotheses, identify relationships, draw inferences, analyze data, evaluate conclusions, and in general, solve problems.

The cognitive-networking process described above can be facilitated by:

1. Giving students the opportunity to work on interesting "real-world" problems that require them to identify, organize, and apply their own relevant knowledge
2. Giving students the opportunity to explore, identify, and discuss their ideas and thinking processes with their peers
3. Explicitly encouraging information-processing skills associated with critical thinking and problem-solving, through the use of effective questioning, feedback, cognitive modeling, and intelligent coaching
4. Providing a supportive environment that motivates and focuses students' learning.

All of the above can be achieved by combining teaching strategies based on the learning cycle (Karplus, 1977; Lawson, Abraham, and Renner, 1989), cooperative learning (Johnson and Johnson, 1984; Kagan, 1990; Slavin, 1990), and anchored instruction (Bransford, et al., 1990; Sherwood, 1991). The learning cycle initially allows the student to explore a conceptual phenomena for the purpose of stimulating disequilibrium. Then, students are given terms associated with the concept to link their experiences with associated verbal labels. Lastly, students are given problems or situations to which they apply their newly acquired concepts to further build a cognitive network.

Cooperative learning offers many useful strategies for students to interact with their peers such as structured peer-group discussion, problem-solving team pairs, peer coaching, and role-based laboratory activities.

Anchored instruction provides a motivational focus that "anchors" students to the learning task. Videotape anchors can be used as a learning environment within which students seek out and apply relevant knowledge, establish new connections, and in effect, build cognitive structures that result in more efficient problem-solving and better conceptual understanding.

Creating and Applying Videotape Vignettes in the Environmental Science Classroom

Videotaped vignettes offer an unique interdisciplinary advantage for teaching environmental problem solving by combining drama, art, language arts, mathematics and science. Such problem-solving macrocontexts offer a richer and more complex environment than text (Sherwood, et al., 1989, March). They are also more motivational and more representative of actual real-world problem solving experiences.

Two VCRs and a camcorder are the necessary equipment needed to create interesting problem-solving vignettes for environmental science teaching. The vignette developmental process typically follows a series of four steps. Having students work cooperatively on each step of the vignette production will add to their learning, motivation, and excitement.

The first step involves identifying a problem situation, that in order to solve, requires application of relevant science concepts. The environment poses many relevant problem situations from local to global impact through which a variety of science concepts may be addressed (Botkin, 1989; Bybee, 1985; Chiras, 1992; Turk and Turk, 1988).

Second, a script is written to include an interesting story line involving a small group of "acting" investigators. For example, a vignette I recently completed, called "River Walk," involves a group of students out for walk along a river. During the walk they make observations that implicate a local factory as responsible for dumping toxic wastes into a river that supplies water to the local town. Students identify sub-problems concerned with stopping the leak, determining the extent of the contamination, and dealing with the contamination. Science concepts center around diffusion, waste management, ground water contamination, and proper sampling methods. Although, this vignette script stops at this point, further script development may proceed with a scenario of the students working together to solve each sub-problem.

Third, a cast of actors and actresses, the stage crew, and the video production crew (all made up from your students) go on location to videotape the drama of each scene. The stage crew insures that all materials and equipment are available for each scene. The video production crew is concerned with maintaining the proper lighting, background, and audio/levels during videotaping.

The final step involves editing videotape segments to eliminate any excess or confusing footage as well as to establish an appropriate vignette sequence with appropriate pauses for reflection. Video and audio RCA connecting cables should be plugged into the "out" ports on the "play" VCR and into the "in" ports on the "record" VCR. The final video vignette is made by recording appropriate video sequences on the "record" VCR from the original videotape that is played on the "play" VCR. Although you will only be losing one "generation" of quality, the final video vignette is more than adequate for use in the classroom.

Once created, videotape vignettes can be used in a variety of ways to provide students with improved thinking skills, concepts, and attitudes about the environment. For example, with the "River Walk" vignette described above, student groups could explore each sub-problem by observing and identifying all possible pieces of information relevant to solving the problem as they watch the tape. This may involve library research to learn as much as possible about the concepts dealt with in the vignette. Students might then apply newly acquired conceptual understanding to put forth hypothetical solutions, make predictions, design experiments to test various predictions, analyze results, and in general, obtain evidence supporting or refuting their problem solutions.

For another example, consider a strategy I have used with a vignette that follows a pair of students on a trip through a remote desert. After becoming stranded, their primary problem is to obtain water for consumption? Student groups are first encouraged to carefully analyze the video to determine available resources and possible water sources. Students often hypothesize that water can be squeezed out of nearby cactus plants by using the car jack to exert pressure on cactus placed between two buckets. Others propose using a plastic sleeping bag cover to create a ground still that collects condensed ground water. In the latter case, the group predicted that one cup of water could be obtained in two hours from a hole three feet square. Second, students do readings on such topics as distillation, succulent plants, and ground water. Lastly, student groups are then assigned the task of designing and carrying out an experiment to test their proposed hypothesis/prediction.

Student feedback was solicited following instruction with the vignettes to identify concerns and impressions. Qualitative data analysis revealed that students viewed the videotape vignettes as motivating and engaging. They came to recognize knowledge more as a means to and end and not the end in itself. They also developed more positive attitudes toward themselves, their teacher, and the environment. The majority felt videotape vignettes were an effective way to learn.

Conclusion

As we move toward the 21st century the majority of the available jobs will increasingly require higher-level information-processing skills that can apply basic scientific and technological knowledge to solve important problems. A critical responsibility of all teachers, and especially teachers for the environment, is to provide each of the many students they "touch" with the thinking skills and understandings to adapt and survive in a "brave new world." The use of videotape vignettes as described in this paper is one step toward meeting this responsibility.

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California LIFE-Leadership Institute for Environmental Education

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The Leadership Institute for Environmental Education (LIFE Ed) is a collaborative effort between Humboldt County Office of Education and Humboldt State University. The California State Personalized License Plate Fund provided money for the grant. The California Department of Education distributes the money and the California Science Project monitors the program. LIFE Ed is one of twelve California Science Project sites, and the only state funded program charged with training teachers and disseminating environmental education materials. The program will serve 100 kindergarten through community college (K-14) teachers over a three-year period. Through systematic, regional outreach efforts, LIFE Ed will serve an additional audience of more than 4,600 teachers by June 1995.

The mission of the program is to support teachers' leadership roles within their schools, districts, and geographical regions; enhance environmental education and science education competencies; and present strategies for strengthening instruction in environmental education across the content areas. Underlying the approach of this program is a belief that environmental education content be infused across the curriculum.

The goal of the Leadership Institute for Environmental Education Program is for teachers throughout California to develop in each of their students an environmental ethic based upon a cooperative effort among all people to maintain a healthy environment, a respect for life, and a sense of environmental responsibility. This goal parallels that of the Green Box curriculum program (widely used in California and available nationwide) which provides a philosophical foundation for the LIFE Ed program. LIFE Ed achieves its mission through activities in four domains: 1) leadership building; 2) an extended staff development outreach; 3) statewide dissemination of exemplary environmental education curricula and materials; and 4) networking and instructional improvement through use of technology. LIFE Ed uses the objectives outlined in the Belgrade Charter-awareness, knowledge, attitude development, skills, evaluation ability, and participation--as operational processes. The six-part process model of LIFE ED links to content in three areas: the natural environment, the built environment, and the personal environment to form a conceptual matrix for instructional design.

LIFE Ed teachers attend a residential 12 day summer Leadership Institute on the Humboldt State University campus. Forty teachers attended training during the summer of 1992, thirty teachers during 1993, and thirty in August 1994. The selection criteria for the 100 Leadership Institute participants are: demonstrated staff development leadership skills, knowledge of published environmental education curricula, administration support, geographic dispersion, and employment in ethnically diverse communities.

During the summer Institutes, participants experience field trips, discussions, and lectures targeting current issues relevant to one or more of the content areas. They process experiences through constructivist modeling, and identify how the Belgrade objectives facilitate the instructional process when designing curricula.

Each day of the Institute is thematic. An introduction sets the stage whereby the upcoming activities are related to previous and future activities. A brief lecture on the topic precedes a constructivist processing activity.

Participants then have the field experience facilitated by authorities in that content area. An evening session provides teachers the chance to process their experience in collaborative grade level and/or regional groupings. Teachers make recommendations of infusion of the content into their school curricula using the Belgrade objectives as a guideline.

Field trips to natural areas include: Redwood National Park, a preserved coastal dune environment administered by the Nature Conservancy, American Indian tribal lands, and a wild and scenic river. Trips to built environments involve: a Louisiana Pacific timber company tree farm, a lumber mill, a central city urban center, a solid waste disposal site, and an alternative energy production facility. Interaction with American Indian elders, quiet reflective time in ancient forests, and journal writing challenges target the personal environment. Processing and reinforcement occur as participants assemble in grade levels and interact using constructivist interchange.

Following the Level 1 Leadership Institute, the participants implement an environmental project in their school or district, and conduct inservice training of teachers in their locale. Level 1 participants return the following summer for a one week Level 2 Leadership Institute where they share their projects and experiences with the Level 1 cohort and further their knowledge and skills with additional training.

There are three methods of assessment; they include: collegial evaluation, staff development records, and portfolios of processing assignments as selected by the participants. Institute participants write about their experiences and personal growth. Using the six processes of the Belgrade Charter model as a framework for their commentary, participants reflect upon the changes they undergo as a result of program elements. During the second summer Institute discussions of the previous academic year's activities, participants receive collegial comments in oral and written form. Finally, each participant submits a reporting form listing specific dates, places, and audience for their project. The form identifies how they continue to fulfill their commitment to staff development for teachers in their district and region. The Director reviews and maintains evaluation data.

Written assessment forms are distributed six times during the 12 day session and a summative evaluation is compiled at the end of each institute. Furthermore, each participant completes a mid year assessment to comment of the effectiveness of the program facilitating their needs; specifically, how the Institute has aided them in the enhancement of their classroom instructional program, and implementing district staff training. The program also undergoes extensive formal evaluation by independent Department of Education evaluators as part of the California Subject Matter Project review.

LIFE Ed is the first attempt California has made at systematically implementing environmental education statewide. The model of teachers teaching teachers at geographically disparate satellite sites is unique and necessary for a state the size of California. The many forms of formative and summative assessment allow evaluators the tools to discern whether the LIFE Ed model is successful. Anecdotal feedback from participants and presenters stress the program is a success.

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Kananaskis Young Scientist Program

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Program Location

The Kananaskis Young Scientist Program is one of a number of School Programs offered by the University of Calgary's Kananaskis Field Station, located 80 km west of Calgary in the Kananaskis Country of Alberta. The Field Station is used by many universities, colleges and schools for environmental science research and education, as the Field Station is centrally located to four major ecoregions of the Central Rocky Mountains; Boreal Foothills, Montane, Subalpine, and Alpine.

Program Description

The Kananaskis Young Scientist Program is designed to provide ecological foundation concepts, issue/values awareness, investigation/evaluation skills and application/action skills for the Environmental Science components of the Alberta Junior High Science Curriculum; namely, the Grade 7 "Characteristics of Living Things", the Grade 8 "Interactions and Environments", and the Grade 8 "Environmental Quality" units of study. To accomplish this, the program utilizes a role playing format for the three or four days of the on-site program, wherein the class is divided into Research Teams of four to five students. Each of the Research Teams sign and carry out a Research Contract for one of the following fictitious groups:

1. The Alberta Forest Research Institute
2. The Kananaskis Valley Recreation Association
3. The Kananaskis Rock and Gravel Company
4. The Kananaskis Conservation Association
5. The Kananaskis Sawmills
6. The Kananaskis Golf Associates
7. The Kananaskis Alpine Resort Consortium
8. The Kananaskis Environmental Research Authority

Each Research Team then has the opportunity to carry out field and lab studies, consult with Guest Scientists, interpret field data and present a proposal on the long-term management plan for the area, on behalf of the group for which they have a Research Contract, to a Kananaskis Land Management Committee. As part of the role play and team building activities encountered during the three or four days, each student within a Research Team has a specific role as an Ecologist. Within each Research Team there are at least four of the following scientists:

1. a Geographer: responsible for gathering and interpreting data on the slopes, abiotic factors, and predicting impact of any or efforts on the slope stabilities or erosion rates;

2. a Plant Ecologist/Botanist: responsible for gathering and interpreting data on the types and location of plant patterns, adaptations of local plants and predicting impact of any development or conservation efforts on the plant communities;

3. a Wildlife Ecologist/Zoologist: responsible for gathering and interpreting data on the types and location of animals, evidence of animals or migration and predicting impact of any development or conservation efforts on the wildlife communities;

4. a Soil Ecologist: responsible for gathering and interpreting data on the soil animals, types of soil patterns and predicting impact of any development or conservation efforts on the stability of soil cover in the area;

5. a Stream Ecologist: responsible for gathering and interpreting data on the abiotic, plant and animal indicators of water quality of ponds or streams, and predicting impact of any development or conservation efforts on the water quality or aquatic habitats.

6. an Environmental Impact Specialist: the Teacher, Parent Volunteer, or Student Counselor assigned to the Research Team; responsible for facilitating and guiding the research efforts of the Research Team and representing the interests of the team on the Kananaskis Land Management Committee.

The Field Studies to carry out the research are scheduled over three main Field Study time blocks, of which two are dedicated to differing forest habitat and one to a stream/pond habitat study. During Lab Studies each Research Team processes, interprets and transfers data to an "ECO-MAP" or "ECOSYSTEM PROFILE" and a "PLANNING MAP", which are compared to a research data base summary chart from the Field Station and used on the last day to present proposals and recommendations to the Kananaskis Land Management Committee. The Kananaskis Land Management Committee, composed of the Environmental Impact Specialists (Teacher, Parent, Counsellor) of each Research Group, then presents a final Management Plan based on the Research Teams' proposals and recommendations.

For further information, contact: Coordinator of School Programs, Kananaskis Field Stations, The University of Calgary, Biosciences 186, 2500 University Drive, N.W., Calgary, Alberta, Canada T0L 1X0, Phone: 403-220-5355, Fax: 403-673-3671

Infusing Environmental Education into the Technology Education Curriculum

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Infusing environmental education into the technology education curriculum is a realistic and feasible means for preparing students to become responsible citizens. The interdisciplinary nature of environmental education brings many benefits to the technology education laboratory. The study of technology with infused environmental issues provides educators with a novel principle: that environmental issues can be understood with respect to real situations as they would appear in an industrial or technological setting. In order to understand the mechanisms that sustain and impact the life forces on the planet, it is imperative students understand the interaction between the environment and technological systems. The application of knowledge is made in relation to technological events and processes so environmental impacts become relevant and are removed from the abstract.

Infusing environmental issues, processes, and concepts into technology education makes it possible to apply integrated knowledge from across the curriculum in order to investigate, analyze, and form solutions to environmental problems. Studying the environment within the context of technology education allows the student to examine trade-offs, consequences, and alternatives resulting from the use of technology.

A suitable framework for the study of the environment and its relationship to technology can be found in the definition of technology education provided by the American Industrial Arts Association (1985). Technology education is:

> A comprehensive, action-based educational program concerned with technical means, their evolution, utilization, and significance; with industry, its organization, personnel, systems, techniques, resources and products; and their social/cultural impact, (p.25).

The content organizers of technology education, communication, construction, manufacturing, and transportation provide structure for the study of technology which has been adapted by humans. Each content organizer supplies an opportunity to infuse environmental education issues into the technology education curriculum. The extent to which environmental issues are found in the technology education classroom is subject to the interpretation of the transition from the industrial arts philosophy by technology educators. Each content area can should be taught with the addition of an environmental component without losing its identity or purpose.

Technology education has evolved from a manual skill orientation. Students enrolled in technology programs profit from this heritage. The transition has caused practitioners to focus on emphasizing skills for life-long learning. Creative and critical thinking, problem-solving, and decision-making are encouraged through student participation in a variety of meaningful technology-based activities. As a result, students become members of a citizenry which is technologically literate and they are able to make decisions necessary to live in a technological society.

The technology education lab is one of the few places in the school where active participation and individual efforts occur on a daily basis. It is where the interdisciplinarity of environmental education and technology education is used to enhance student understanding. Integration of subject matter from all disciplines is a more realistic system for learning than acquiring skills in isolated disciplines.

The diversity of problems found in the activities of the technology education laboratory allows students to transfer their knowledge and skills in many settings. As students use their abilities, they come to realize that problems come in numerous forms and may be solved differently using knowledge gained from disciplines outside of technology education. This type of learning facilitates transfer of knowledge through life (Hungerford and Peyton, 1986; Maley, 1973; and Travers, 1972).

The inference that technology and the environment have an antagonistic relationship has contributed to a negative view of technology. Hass (1987) observed,

> ...that the starting point and motivation for environmental education generally lies in damage suffered by our world... The educational concepts thus derived contain a "destructive therapy" of a strong negative tone. Meaningful action is reduced to a kind of "avoidance strategy" characterized by an attitude of fearful expectation. Technology as an applied science has developed into an "enemy of nature" (p. 85).

Making use of environmental issues in the technology education curriculum should assist students, and teachers alike, with a means of determining the role of technology in the degradation of the biosphere. It is in this manner that bias can be put aside through the use of critical examination of the processes, systems, and products of industry and technology. Students study technology as the origin and solution to environmental problems in the infused approach. An informed population will benefit from the technological choices made by a majority rather than suffer the consequences of mandated change by the technologically elite minority. The function of the infusion of environmental education within technology education is to endow all students, no matter what their goals, with the skills to make decisions about the design, production, and use of technologies that enhance the quality of life.

The similarities between technology education and environmental education make infusion desirable. Both areas emphasize efforts which allow students to synthesize information from other disciplines and foster the development of integrated knowledge. Other notable similarities between technology education and environmental education are: interdisciplinary emphasis, commitment to citizenry preparation, student focused, action oriented, and opportunities for realistic problem-solving.

The infusion of environmental education into the expansive technology education curriculum strengthens each area's place in the school. Advocates of technology education and environmental education should be pleased with infusion because there are opportunities for realistic and holistic experiences. The technology teacher must carefully analyze course content for the purpose of identifying where environmental issues are applicable. Successful infusion requires that the technology educator collaborate with colleagues from other disciplines in the school. The removal of artificial barriers built around academic areas in the school lends itself to cooperative teaching efforts. Improved relations and understanding among teachers will certainly heighten respect for each individual's work.

Environmental issues interwoven with technology education can be modeled in the technology laboratory. The myriad of instructional strategies available to the technology teacher include, but are not restricted to: role playing, simulations, consultations with experts in the community, seminars, research and experimentation, model construction, group and individual projects, and technological evolution studies.

The communication area provides examples for the infusion of environmental issues. Student learn to be more selective consumers as a result of investigations about packaging. Design considerations concerning the need of the consumer and impact on the environment are explored in relation to the purpose of the package. Construction is assessed to determine the environmental impact of the design, materials, and processes. Packaging the students purchase is brought to class to verify if it is made of recycled or recyclable materials. Waste disposal issues such as photodegradability and biodegradability are evaluated by experimentation. Issues related to recycling, reduction, and re-use are often resolved in the technology lab. Students are made aware of the environmental and social consequences of overpackaging. These examples help students foster proper attitudes toward the environment. They encourage students to problem-solve using real items.

A forum for other disciplines in the school becomes available as a result of infusion. The English teacher may assist students with letter writing to experts and producers of products. The social studies teacher may present students with information about regional effects caused by the use of local resources. The science teacher may be able to demonstrate the environmental principles that cause the greenhouse effect. As a result, students acquire skills, knowledge, and attitudes that go beyond the boundaries of the classroom and school, and out into the community. Simmons (1989) noted they begin to discover they have skills allowing them to interact with the environment, "beyond that of simple understanding of scientific or ecological principles" (p. 15).

Conclusion

Environmental issues infused with technology education will assist individuals for citizenry in a technological society. Students participating in such a program develop skills that will assist with the maintenance and improvement of the biosphere. Their acquired skills, knowledge, attitudes, and experiences will assist them in taking action to resolve environmental problems.

Technology education teachers must develop infused programs for the benefit of their students. Such programs improve the quality of education and provide a great opportunity for technology education to stand as an equal partner with all disciplines.

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EarthVision--EPA's Grand Challenge for High Schools

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Overview

EarthVision is a computational science education program designed to introduce teams of high school teachers and students to computational science, supercomputing, and environmental modeling. The goals of EarthVision are to attract students to technical and environmental sciences and thereby contribute to a better-trained work force.

Computational science is a new way of doing science. It differs from traditional methods of laboratory experimentation in that it relies on supercomputers to re-create or "simulate" natural phenomena represented by complex mathematical models. The speed and capacity of supercomputers allow environmental scientists to model the interaction of variables which, owing to their complexity or remoteness, cannot be tested in a laboratory.

EPA's National Environmental Supercomputing Center (NESC) began operations in October 1992. It houses EPA's first supercomputer and the first supercomputer in the world dedicated solely to environmental issues. The Center is located in Bay City, Michigan.

EarthVision: EPA's Grand Challenge for High Schools began in December 1992. EarthVision is sponsored by a cooperative agreement between the U.S. Environmental Protection Agency and Saginaw Valley State University in University Center, Michigan. For the program, the participants have access to EPA's supercomputer at the National Environmental Supercomputing Center (NESC).

EarthVision is comprised of three components. These include: Saturday Tutorials, a Summer Research Institute, and a Follow-Up Research Program.

Saturday Tutorials

During the Saturday Tutorials, student/teacher teams attend classes at EPA's NESC. The classes meet one or two Saturdays a month for a full academic year. Curriculum includes Mathematics (linear algebra, systems of equations); Programming (UNIX, Fortran, program optimization); Computational science (vectorization, algorithms, model development); Scientific visualization (software packages, animation, video recording); and, Environmental modeling.

Additionally, the teams are taught how to develop environmentally-related research projects using computational science techniques. They also receive instruction in developing and giving presentations.

Teams are composed of two teachers and four students. Teams are encouraged to have one teacher with a specialty in math and computer science and the other teacher with a specialty in one of the physical sciences. Students have a variety of backgrounds, but are typically strong in math, computer science, and the physical sciences. EarthVision teams are selected on the basis of their background and their willingness to commit to a full academic year of Saturday Tutorials.

For the first year of EarthVision, three teams were chosen to participate in the Saturday Tutorials. During the upcoming academic year, there will be six teams attending the Saturday Tutorials.

The Saturday Tutorials help prepare teams to participate in the second component of EarthVision, the Summer Research Institute. However, participation in the Saturday Tutorials is not a requirement to participate in the Summer Research Institute.

Summer Research Institute

During the three-week Summer Research Institute, student/teacher teams live in dormitories and attend classes and workshops at EPA's National Environmental Supercomputing Center. The goal of the Summer Research Institute is to give student/teacher teams in-depth instruction in applying computational science techniques to an environmentally-related research project of their own design. Projects relevant to the Great Lakes are encouraged.

To apply for the Summer Research Institute, student/teacher teams submit a research proposal describing the project's goals and proposed method of solution (including computational algorithms). The teams also submit a curriculum proposal outlining a plan for incorporating computational science methods into the existing math and science curriculum of their high school.

The student/teacher teams receive advanced instruction in computational science, scientific visualization, and environmental modeling during the Summer Research Institute. They also meet with potential mentors to better define their research proposals.

This year, two teams participated in the Summer Research Institute. In the summer of 1994, four teams will be invited to attend the Summer Research Institute.

Follow-up Research Program

The Research Program lasts the entire academic year following the Summer Research Institute. During the Research Program, the EarthVision teams complete their research projects on workstations networked to the supercomputer at NESC.

At the conclusion of the Research Program, the EarthVision teams will have a final research paper suitable for publication, a poster display, and a proposed curriculum plan. The curriculum plan will include: 1) A plan for introducing computational science concepts and topics into the math and science curriculum of the high school; 2) A plan for exposing area high school students and teachers to the use of computational science in environmental problem solving through workshops, field trips and/or teleconferences; 3) A report on the status of outreach programs undertaken to acquaint other teachers, students, and neighboring schools to computational issues and environmental problem-solving, and; 4) A strategy for developing presentations or publications discussing the effect of supercomputing on science and education.

Overview of Student Projects

The EarthVision team from Bay City High School is examining the possible role of zebra mussels in the accumulation of PCBs (polychlorinated biphenyls) in Great Lakes fish (Neal et.al.). Following an extensive literature search, the team identified a specific food chain in western Lake Erie into which the zebra mussel has been introduced. The team used a food chain model to simulate the bioaccumulation of PCB's up the food chain.

For their mathematical model, the Bay City team translated a mass balance equation into FORTRAN instructions. The mass balance equation generated synthetic data of PCB levels over a 90-day period. The team transferred the output from the model into a two-dimensional data array format that is readable by Explorer visualization software. Their visualization, which they created on a graphics workstation, shows how the PCB concentrations in prey relate to PCB concentrations in predators.

The Bay City team is working to obtain more accurate and current data. They are refining the mathematical model to more accurately represent bioaccumulation and the gain and loss of PCBs.

The team from the Saginaw Center for the Arts and Sciences (Sefcovic, et.al.) is examining the distribution of heavy metals in Saginaw Bay by developing a mathematical model of how heavy metal ions interact with water, sediments, and living organisms. They are creating scientific visualizations of the output from the model and they will test the efficacy of their model by comparing it to actual data.

The Saginaw team is using their model to test several research questions. These include: Does point source contamination affect distribution differently than multiple site contamination? How do instantaneous emissions compare with long term seepage in affecting heavy metal distribution? What contribution does Lake Huron make to heavy metal contamination in Saginaw Bay?

Innovative Aspects

EarthVision is unique. It is the first computational science education program to offer Saturday Tutorials as a way to prepare teams to compete for placement in an intensive summer institute. It is the only computational science education program to concentrate solely on environmental issues. In addition, it is the first such program to require students to participate actively in multi-tiered outreach activities. For their outreach efforts, the EarthVision teams discuss their research projects and research methods with their peers and the general public.

Finally, EarthVision is among the first computational science education programs to offer a parallel intern track for graduate and undergraduate students. The Research Interns are required to conceive and complete an environmentally-related research project using computational science techniques. In conducting their research, the Interns will face many of the same sorts of obstacles encountered by the EarthVision teams. The Research Interns will find ways to overcome the obstacles and will share their newly acquired knowledge with the EarthVision teams. Additionally, the Research Interns will help implement outreach programs, assist school teams with their research and curriculum plans, provide technical support, and aid in networking with Mentors.

Conclusion

In its initial year, EarthVision provided a stimulating introduction to computational science and environmental modeling. Throughout the program, enthusiasm remained high and the teams consistently worked 12-14 hour days. The two teams went further during the Summer Research Institute than was originally anticipated and they actually began conducting their research. They formulated preliminary mathematical models, wrote code to represent their models, and prepared initial visualizations of their data.

The EarthVision Mentors were instrumental in helping the teams move quickly through the course curriculum and begin their research. The Mentors were environmental researchers working at EPA's Large Lakes Research Station, EPA's Environmental Research Laboratory-Duluth, Dow Chemical Company, Alma College, and Manhattan College. The Mentors helped the teams integrate complicated views and methods. They also helped the teams refine and focus their approaches, find additional data, and construct computational models. The teams will continue their associations with their Mentors during the academic year via electronic mail and videoconferences.

The team approach was another important factor in the speed with which the teams progressed during the Summer Research Institute. Team members selected particular project tasks on which to concentrate so that various aspects of the research projects were completed faster than if the team members worked independently.

Peer review activities also contributed to the accomplishments of the EarthVision teams. By presenting research summaries to students participating in the National Science Foundation's SuperQuest program, the EarthVision teams were forced to clarify their objectives and solidify their research methods. They also benefitted from comments and suggestions offered by the SuperQuest teams.

Perhaps the greatest contributing factor to the success of EarthVision was the tremendous group effort that went into its inception, refinement and implementation. Instructors and staff at SVSU, EPA, and NESC worked long hours to design an innovative program that provides high school teachers and students with an in-depth introduction to supercomputing, computational science, and environmental modeling.

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Teens as Leaders for Environmental Science Education and Community Service--The 4-H Series Experience

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Background

The 4-H SERIES (Science Experiences and Resources for Informal Education Settings) Project is a program for improving the science literacy of youth. The overall goal of the 4-H SERIES program is to increase both the quantity and quality of science experiences available to youth in a way that develops a clearer understanding of how science relates to their everyday lives. Specifically, we aim to: 1) provide interesting, accurate, hands-on "sciencing" experiences that include learning the operational processes of science (observing, communicating, comparing, organizing, experimenting, inferring and applying); 2) engage teens in delivering SERIES activities to younger youth; and 3) encourage each youngster to use the process and approaches of science to address and work toward solution of community issues.

Initially funded by the National Science Foundation in 1987, the 4-H SERIES program now offers eight curricula [*Beyond Duck, Cover, And Hold*, (disaster preparedness); *Chemicals Are Us*, (chemistry); *It Came From Planted Earth*, (agriculture); *Oak Woodland Habitats*, (habitat awareness); *Recycle/Reuse/Reduce*, (recycling); *Ridges To Rivers*, (watersheds); *Sciencing With Snails*, (using science processes); and *What's Bugging You?* (pests)]. Each curriculum uses a cross-age teaching strategy with volunteer teens leading younger youth in hands-on inquiry activities. Each of the curricula have ecological implications, and each is geared toward youth participating in community service applications of what they learn. Currently, the National Science Foundation, along with the W.K. Kellogg and DeWitt-Wallace Foundations are supporting SERIES dissemination in more than 30 states and Puerto Rico.

Teens as Instructional Leaders

All too often teen age youth are viewed as community problems rather than community resources. By providing teens with an opportunity to make a positive difference in their community we have found them to be more than adequate to the task. Oftentimes the issue of their making a difference revolves around whether they are aware of a difference worth making. We have identified several attributes of appropriate teen led environmental programs: 1) It involves hands-on activity; 2) The activities work; 3) It is important; 4) It is fun; 5) There is an opportunity to alter the program if the need arises; 6) Acknowledgment; 7) Evidence of accomplishment; 8) Opportunity to work with other teens; 9) Support, via coaching, etc.; 10) Artifacts of success, such as project portfolios.

SERIES Instructional Design: The Learning Cycle

Since Socrates' time, and probably even before, teachers have known that we learn best through our own guided investigations followed by thoughtful conversations with others. For the past several decades science educators have known that an instructional sequence known as the "learning cycle" is one of the most effective means for having students learn the concepts and processes of science. The learning cycle has been found effective for developing a learner's reasoning abilities and for reducing scientific misconceptions. Educators using meta-analysis techniques to assess results from research on instructional interventions have found the learning cycle is effective in enhancing textbook learning (Guzzetti, Snyder Glass, and Gamas; In Press) and for overcoming student misconceptions in science (Guzzetti, Snyder, and Glass; 1992). Guzzetti's current work indicates that the learning cycle is particularly effective when used in combination with other instructional interventions that produce cognitive dissonance such as prediction labs, Socratic teaching methods, etc. The learning cycle instructional model designed into recent science education curriculum materials (i.e. 4-H SERIES) involves three distinct types of instructional methodology, presented in sequence...

1. EXPLORATION...usually an introductory activity designed to provide the experiential foundations upon which conceptual understandings can be built. The youth learn through their own actions and reactions with minimal guidance or expectation of specific accomplishments. This might include individual investigations or small group work. This activity usually accounts for approximately 30% of the time allocated to the activity.

2. CONCEPT INTRODUCTION...usually begins with the group of participants sharing observations made during the exploration activity. Facilitated by judicious leader questions, this discussion will culminate with the introduction of a new concept or principle (i.e. evidences of a chemical reaction, concentration, etc.), that leads the participants to discover, and understand the concept based on explicit observations, comparisons, data assessment etc. The concepts are then available for the participants to apply in new patterns of problem finding and problem solving. Concept introduction discussions normally account for 20% of the time allocation for the activity.

3. CONCEPT APPLICATION...extends the range of applicability of the new concept. It provides additional time and experiences for stabilizing the new concepts and reasoning patterns. Youth-led community service is an example of how participants can transfer their learning of science concepts into making a visible difference in their homes and communities. An assumption by nonformal science education programs such as 4-H SERIES is that a primary goal of learning science is not merely providing more information about science, but rather the development of scientific thinking strategies and decision making skills. In the learning cycle model, concept application activities (community service activities, etc.) account for approximately 50% of the educational learning time allocation.

From Hands-on Learning to Community Service

Two arguments can be made for using the "learning cycle" instructional model to support community service:

1. Increased relevance and connection between what is being learned in the educational setting and "the world." This is provided by focusing on environmental topics of intrinsic interest to youth, and concepts that can be understood and applied to community service projects by participating youth. Relevance to participants can be increased by providing additional opportunities for youth to experience success in science learning and to learn about environmentally-related education and career options.

2. Increasing participants' sense of self-worth and efficacy vis-a-vis contributions to environmental issues through community service. Youth are taught collaboratively to solve novel real-world problems. The community service activities give youth participating in programs such as 4-H SERIES an opportunity to use the scientific thinking skills they have recently learned to analyze, innovate, create, and communicate to make a positive difference in their communities.

SERIES community service efforts do not stop with simply improving science literacy, we expect teen leaders to plan and conduct community service projects with their youth participants. These community service projects are identified, designed, implemented and evaluated by the teens and youth participants. They often result in very innovative and useful projects that draw the attention of local media. For example, two 4-H clubs in Santa Barbara, California presenting the SERIES Recycle/Reuse/Reduce unit planned and carried out a comparison beach clean-up. They collected debris from a beach on the coast of California and from a beach on one of the nearby Channel Islands. Their efforts resulted in the collection of more than 800 pounds of trash from the two beaches, and was written up by the local newspaper.

Through community service programs such as SERIES, teen leaders and younger youth can assist with national efforts to improve science literacy, as well as environmental and social conditions...and, at the same time, provide them with opportunities and differences worth making.

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Missing Links

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Education is an abstract concept that has been invented and reinvented for years. It is not so much the "what", that is in question, but the "how", that is continually researched. Educators proclaim they want students to actively participate in learning, to take fundamental knowledge and apply it outside of the physical structure of school. To do this we have advanced the tools of education, but pigeon holed information into small time schedules, loosing the flexibility and cohesiveness of subjects. Thereby, we limit the time allowed the students to draw conclusions and to link the relevance of topics to each other and their world. We have limited curriculum to time components, overloading schedules and teachers with fragmented topics, increasing rote learning and decreasing applications and evaluations. The higher cognitive levels can be reached in several areas through an integrated curriculum based on Bloom's Taxonomy, flowing through a common link. The missing link in our educational taxonomy is environmental education.

Sounds pretty easy, especially for elementary grade levels, but in fact it is not. In true style of any utopian theory of education it is unreachable without an overhaul of the accepted structure. Integrating curriculum can be done in degrees and in fact most of today's educators have done this at the simplest form, using supplemental activities. The most often used resource for these activities is the Project Wild series. These resources, and others like them, most often combine art and literature with science. They have also combined many science topics with social studies, math, and physical education. The ease and availability that these and other guides provide, have assisted many teachers with the beginning step to integration; inserting activities periodically into existing lesson plans and curriculum. But, in many cases integration stops at the use of one or two activities for a specific and short period of time. Often is the case where evaluation and discussion are limited or omitted because of time restraints, insecurity with the topic or format, vague goals and objectives, or rigid curriculum that takes away from the teacher's own creativity.

The next level of integration is being played with by several schools. That is to unite teachers into teams to build individual subject area curriculum containing integrated units. These single units are based on a common overlapping concept or activity, usually based in the science realm, that binds the various subjects together. By this design individual, top heavy curriculums for each subject area still exist, they are not a unified curriculum. We continue fragmenting information and reducing the relevance of any attempted integration.

The actual development of one curriculum, integrating all subject areas under specific goals and objectives based on environmental concepts is rare. Its creation is delayed due to the current structure of schooling. Many teachers are rooted to their lesson plans and have used them for many years, making a change to a new set of goals and objectives difficult. Administrators and teachers must look at the whole school's curriculum to see not only what topics each grade level should study, but what concepts students should master by the completion of the year, so they will be able to apply them to the next grade level. Elementary grades have been locked into teaching in terms of "X" number of units, i.e., Native Americans, Rocks, Water, Addition Europe... By focusing on specific goals and incorporating them into our past and present relationship with the environment, the students will be actively involved in the learning process and will have the time to develop problem solving skills allowing them to make judgments that will, hopefully, shape their and our future relationship with the environment.

Bloom's Taxonomy is a curriculum format that allows for this necessary integration of subjects, encouraging needed problem solving skills, without restricting teachers from developing original lessons. Bloom's is not new on the scene of education. It came out in the mid-1950s having been conceived in the late

1940s. The taxonomy is structured around three parts-the cognitive, the affective, and the psychomotor domains. There are six major classes in this taxonomy:

1. Knowledge: information recall, specifics
2. Comprehension: make use of knowledge, display understanding, extrapolation
3. Application: use abstractions, predict, experimentation
4. Analysis: organizational skills, cause/effect, hypothesize
5. Synthesis: creativity, writing skills, research
6. Evaluation: quantitative and qualitative judgments, critique skills, comparisons

An interesting feature of Bloom's is its pliability. It does not have to follow a precise linear pattern. It is possible to manipulate the order of levels and even bend them into a circular pattern, thereby making integration attainable as long as there is a common link, environmental education.

Environmental education is currently not a major part of general schooling. It is sometimes a unit, an individual project, or basis for a club, but not actively taught at the elementary level. In view of current issues, and world changes it is necessary to educate the student about their environment.

We have advanced as a society to one that is removed from the "natural world" by technology, mechanization and civilization. Basic identification and understanding of animals, plants, resources, and their interrelationships are no longer common knowledge. But, as many have pointed out, environmental education is in itself not defined. Steve Van Matre discusses the confusion and problems in focus and practice between environmental education, outdoor education, and natural history studies in his book, Earth Education, A New Beginning. For the purpose of environmental education in this paper, all are necessary components for successful learning just as numbers, equations, and geometry are components of the general topic; math.

We need to step back and see that our relationship with the natural world shaped our ways of settlement, economy, medical, scientific and cultural development. This equates to art, science, math, social studies, literature and geography equaling schooling. If we state curriculum goals for standard subject areas in terms of Bloom's Taxonomy unified through environmental education, teachers would see the natural links between subjects and still have the flexibility to create lessons with which they are comfortable. This would allow students, of all learning styles, to directly participate in learning, see relevance of subject matter and be able to apply this relevance to their physical surroundings and the larger environment.

For secondary education integration of subjects faces a different situation. Secondary education varies from elementary in that it is based on subject division for the purpose of in-depth study, directed by one educator per subject. Elementary education usually has one teacher per class shouldering all subjects. Integration is best done at the elementary level. This will help in providing a common knowledge, often lacking, necessary for secondary education's focused studies. For the secondary level it would be best to include environmental education as a separate course so that it too may be studied in depth.

At what level of integration is your curriculum: activity, unit, or complete curriculum integration? To reach complete integration educators and administrators must all learn more on the relevance of subjects and their real life applications. Encourage fellow teachers and your pupils to attend public forums and programs at resource centers like zoos, nature centers, museums, universities and the like. Expand your reading to include nature study, phenomenon and factlet collections, behavior and language origins and start to think BIG.

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Teaching Environmental Educators

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A case history of one of the early college programs in outdoor/environmental education may be useful because it became the prototype for many other degree programs and teacher workshops. When, in 1972, the master's degree specialization at California State University, Hayward was announced in a modest notice in the NSTA newsletter, 72 other graduate schools across the country asked for information. We also had models, for on a 1970 sabbatical I studied programs across the United States, and especially used the programs at the University of Michigan, Michigan State University, Northern and Southern Illinois Universities and San Francisco State University as a basis for our draft plan. More than that, I visited school outdoor education programs to asses the needs for teacher training.

California State University, Hayward was founded across the bay from San Francisco in 1957 with plans for an environmental education program. When I joined the initial faculty in 1960, I was immediately welcomed by a "Life camper" and assigned to meet an outdoor school director to plan the participation of student teachers as a part of their regular credential program. The next fall, a science education professor and editor of the University of California Press field guide series, Art Smith and I offered a one day workshop for teachers on a natural area next to campus. Fifteen came to this unique (at that time) field day although no credit was offered.

Extension Courses

In the fall of 1964, in a nearby suburb of Walnut Creek, a Saturday extension class demonstrated how environmental/outdoor education could be integrated into the curriculum. Each day we focussed on two content areas, e.g. one morning we wrote poetry and in the afternoon we set it to music for primitive flutes. Each week I used one curriculum specialist for half of the presentation.

The enthusiastic class wanted to continue in the winter quarter to design their resident outdoor education programs for spring. The numbers grew to over thirty. One principal brought her husband, the Alameda county curriculum coordinator, and five teachers from one school brought their principal. The enthusiasm continued its momentum into spring, when we took a look at community resources for environmental education, e.g. parks, industry, and organizations. These courses were repeated and revised according to class evaluations and school and community needs. We began to pick up park personnel as well as teachers in the enrollments. The interchange between them and elementary and secondary teachers has proved worth keeping.

Meanwhile as the United States government became more involved in education, the US Senate passed the Education Professions Development Act grant. At a meeting with Don Lundstrom and Bill Landis, the science education directors from the two neighboring metropolitan counties and Chris Nelson, chief naturalist for East Bay Regional Parks, it was decided to apply together for a three year project. The first year, 1969, was a modest planning year that began with a community survey. It showed isolated efforts across both counties but no coordination. In 1969-70 fourteen workshops offered each 15 elementary and secondary teachers a five day course in the regional parks while substitutes taught their classes. Visitors, often administrators, were allowed up to a group total of twenty. Every morning we met in a different park with a different naturalist who "interpreted" the park while the instructor encouraged inquiry approach and educational applications where appropriate. In the afternoon the instructor led the group in educational activities more appropriate for the park than a school yard, supported by the park naturalist who made content suggestions. On Friday afternoons, each teacher taught one activity at the final park.

The third year the Senate discontinued all funding for EPDA grants, but each fifth of the course was offered separately as a Friday evening-Saturday workshop. That continued to draw significant numbers for two years.

The EPDA workshops were evaluated by an outside evaluator and written up in an Alameda County publication, Environment--A Way of Teaching, (o.p.). Ten years later, a master's student drawn from that group, Maxine Burnworth, did a follow up survey of those teachers. The amazing finding was that they remembered everything that had happened. Most were still involved in environmental teaching and several had earned master's degrees.

A Graduate Degree

By this time the embryo college had reached adolescence to assume a university attitude and propose a master's program in curriculum with a specialization in environmental education. Environmental education became part of the master plan for the university. The first year a false rumor escaped that we offered a one year scholarship, and the first day the corridor by my office was filled with a double line of applicants that went around the corner. Dispelling that rumor got rid of a lot of non-scholarly but enthusiastic outdoor people, so we could graduate a respectable class in 1972. The classes were based on the continuing extension courses that had begun in 1964. At the beginning of the graduate program, there was a seven year limit and liberal transfer allowance from extension. Two additional classes filled out the special sequence: research and trends in environmental education, and field study which was designed for innovative summer classes or field experience for non-teachers, usually program directors. All of the students take a core of curriculum foundations, psychological foundations, research and write a project or thesis. This year an optional culminating synthesis course has been introduced as an alternative to thesis or project. It works out that one third of the courses are in the environmental specialization, one third in the curriculum core and one third are electives which may be selected across campus. Since the beginning of the education graduate program, other departments have introduced more environmental education emphasis and an interdisciplinary major in environmental studies may support the environmental education master's work.

About one hundred fifty students have received degrees, but at least ten times that many have elected courses to combine with other options. The alumni usually remain in the area and have formed a cadre that meets at an annual environmental education fair, writes curriculum guides, and conducts their own teacher workshops. At the start we were unique; now an environmental workshop is available at least once a month. At first no curriculum guides were written; now you know well the plethora that exist. The courses began as outdoor enrichment; by student demand and through the influence of the media and special international projects they have become more urban centered and more focused on environmental considerations. Syllabi are available from the author.

Community Outreach

Subsequently under the bi-county leadership, advisory committees were looking at sites for outdoor schools and planning an education program for East Bay Municipal Utilities District land, which involved teacher workshops on effective use of field trips. The water district published an education use plan was published with an accompanying slide program. That program has been modified to meet the curtailment of field trips by district budgets, but the water district still publishes and disseminates educational materials and provides education consultants to schools.

After the publication of the California Environmental Education Guides in 1981, California State University, Hayward, with an environmental license plate grant from the State Department of Education, offered a new series of seventeen workshops. The pattern is worth emulating. The director met with the curriculum director of each interested school district to plan the specific curriculum needs which might be met through environmental education. Usually the administrators chose science and designated either primary, elementary, or middle school. For examples, several administrators wanted an "energy"-focused, interdisciplinary unit; another wanted us to follow a single concept through the grades. Then my excellent student assistant and I matched the state environmental education guides to the related textbook series or framework, to show how the activities presented the required content. These were tailor made one day workshops. In one district three curriculum consultants shared the planning and execution of the workshop. A month later we met the participants in a two-hour after-school session to share additional curriculum materials they needed but mostly to let them share the experiences they had teaching the activities to their own students and to recommend adaptations. A representative of the campus media center video-taped the workshops. A questionnaire, sent out six months later, evoked an 85 percent response of very positive reactions. The following year Alameda County Office of Education presented and evaluated similar workshops in districts which we had not reached.

Continuing Interest

Other colleges are offering courses in the area too, some taught by our alumni. Our own Department of Teacher Education has a strong commitment to environmental education in its master plan and infuses environmental concepts and applications into many of the methods courses. Student teachers still have the option of participating in resident outdoor education programs. Esther P. Railton-Rice, Professor of Education-Emerita, California State University-Hayward, Hayward, CA 94526

Core Values in the Curriculum--Avenues to Active Learning

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Adolescence is often a tough time in one's life. Sometimes it may be easy to travel down a path that someone else has chosen, hoping the view at the end of the road will suit our needs. We may be in for a bumpy and uncomfortable ride, arriving at our destination only to ask why.

Growing institutions are often faced with many of the same dilemmas. Administrators, faculties, governing committees, and students are constantly faced with decisions which will affect the growth and ultimate success of the institution. Growth often involves trying new things; recognizing that there are associated risks with any new project we take or road we walk. What guides our course? How do we not lose direction?

As with adolescence, institutions must often rely on a set of accepted values to see them through the times of fast and often difficult growth (Hall, Taylor, Kalven & Rosen, 1991). Peters and Waterman have written extensively on the need for organizations to be value driven:

> Let us suppose that we were asked for one all-purpose bit of advice for management, one truth that we were able to distill from the excellent companies' research. We might be tempted to reply, "Figure out your value system. Decide what your company stands for." (Peters & Waterman, 1981, p. 279).

At Edison Community College we often turn to the institution's "core values" to help us make decisions with the growing pains. Senge, at MIT's Sloan School of Management, describes such core values:

> Core values are necessary to help people with day-to-day decision making. Purpose is very abstract. Vision is long term. People need "guiding stars" to navigate and make decisions day to day. (Senge, 1990, p. 225).

Everything from employment interviews to curriculum development may be influenced by these core values. These shared values have become the cornerstones in the foundation of the college.

Through the collaborative effort of both faculty and administration, the following core values were established for Edison Community College in the summer of 1990:

- Communication
- Critical Thinking
- Cultural Diversity
- Ethics
- Inquiry/Respect for Learning
- Interpersonal Skills/Teamwork

In science we know the importance of observation. As a science educator, I am always looking for new and different ways to implement classroom active learning. Could these new core values promote more active student learning in the classroom? Much research has indicated that science classrooms could improve student learning if they promoted more active learning, where each student accepted a major part in the responsibility for his or her own learning (Litecky, 1992).

The time was right for the scientific method. The hypothesis was simple: core values in the curriculum would provide avenues for active learning.

With the college's adoption of the core values, I set out to implement the core values in the Science curriculum and courses under my control. The materials needed for this project were extensively reviewed: text, lab investigations, assignments, presentation of material, and the students' role in the learning process. With the vast amount of new information in science and technology, the time was at hand for a paradigm shift in teaching methods. The shift would be away from teaching all content and move toward the concept of introducing students to various learning methods.

Fundamentally all of the courses would have three objectives. The learner should be able to:

1. Find accurate information about a subject.
2. Critically think about the information that has been researched.
3. Efficiently communicate this information in both written and oral form.

There would be a strong emphasis on collaborative learning methods, realizing that many topics would elicit differences of opinions within members of a group. This method would allow the learners to explore the many different ethical implications of topics relevant to the course: genetic engineering, in vitro fertilization, world population, etc. Many of the topics would have a direct link to different cultures not only locally but globally. Critical thinking skills would have to be explored and used within the groups for successful completion of collaborative projects.

It was not that difficult to test the hypothesis in the class. A textbook review produced a new text and lab manual that fit the new course objectives and emphasized methods of critical thinking. Establishing small groups was not difficult and followed some of the traditional methods of using lab partners in science classes. Classroom seating was reorganized to accommodate collaborative projects, discussions, and assignments.

The learners were told that they would be evaluated by many different methods. The traditional objective exams would still be used to some extent. The evaluations would be open book, open note format, consistent with the course objective of finding accurate information about a subject. The level of questions would shift clearly from Bloom's level one knowledge (Bloom, 1956) to questions with an emphasis on comprehension, application, and analysis. Student lab reports would include both written and oral communication with the instructor. Learners were told that there would be a definite shift from lecture sessions to more inquiry and active learning activities in class. All of these new learning methods were developed with the core values serving as the initiative. Students were constantly reminded that these methods require that they take a greater responsibility for their own learning.

The results of the project were intriguing. As expected, students were at first somewhat apprehensive of group projects and often would follow the traditional phases of group development described by Tuckman (1969) as: forming, storming, norming, and performing. Many students will admit that they are uncomfortable with collaborative projects early in the term. An important role of the instructor is to encourage all of the members to contribute to the group.

At the end of the term the students were surveyed concerning the newly implemented teaching materials and methods. Classroom surveys (ECC student survey, 1993) provided the following information:

When asked what type of learning style they prefer, the responses were:

- 86% of the learners chose the classroom which was involved in activities which require students to, "find, think about, and communicate information utilizing many different learning methods." (ECC student survey, Spring 1993)

- 10% of the students indicated that they preferred the more passive learning method of the traditional teacher/lecture/student/note taking class

- 4% of those surveyed were undecided or indicated that they would like both methods of instruction

Perhaps the most important information from the surveys involved the responses to the following question. "In your opinion, which of the two learning styles described (active or passive) will help you have more success in your future employment or learning environments" (Edison Community College, 1993). The students' survey indicates:

- 80% of the students stated that the active learning methods would better prepare them for the future

- 4% chose the passive learning styles

- 16% were undecided or chose both learning styles as acceptable methods.

When students were asked about their role in the learning process:

- 96% agreed with the educational philosophy that the learner, "is expected to take responsibility for his/her own learning" (Edison Community College, 1993)

While I realize that this is a small amount of data, it provides evidence to support the hypothesis: core values in the curriculum would provide avenues for active learning in the classroom.

Over the past year I have attempted to capture some of the classroom activities on a short videotape illustrating the connection between core values and active learning. The connection becomes evident. Students are actively engaged in their learning. They take responsible ownership of their learning. Perhaps most importantly, learners begin to develop the affective domain of critical thought and personal values. In an entirely candid comment, a student summarized the concept so well. "This class gave me a chance to question other people's opinions and values, but most importantly, it gave me a chance to look at my own" (Edison Community College, 1993). Indeed, core values are important during the lifelong growth of individuals and institutions alike.

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High School Students: From Awareness to Action

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This research explored the effects of a three-week residential environmental science academy for 11th and 12th grade students on the environmental literacy levels of the students, their personal environmental responsibility, and their self-concept. The Academy is organized in two phases: phase one consists primarily of lecture/discussion and field trips concerning environmental education issues, while the second phase focuses on environmental action. Two separate studies have indicated that students exhibit higher levels of environmental literacy and environmental responsibility, as well as growth in the affective domain, after participating in the Academy.

In 1989, the Oklahoma State Regents for Higher Education established High School Summer Academies in Science and Mathematics for the purposes of enhancing and supplementing established high school curriculums and to solicit under-represented minorities. The College of Education and the Graduate College at Oklahoma State University thus proposed a program where high school students were organized into research teams to study interdisciplinary environmental issues. The curriculum consists predominantly of field trips to sites of major environmental problems facing the state of Oklahoma.

The Environmental Science Academy is designed in two phases. The first phase is based on the OSU campus for three weeks and involves field trips, classroom and laboratory instruction. The second phase involves follow-up activities in the form of a survey where students analyze energy, water, toxins, and solid waste use in their home, school and/or community. Students are also asked to initiate and/or participate in an environmental action project. The survey results and action projects are brought back to campus for the Fall Equinox weekend in September.

Formal evaluations and research studies were conducted on the participants of the 1991 and 1992 Environmental Science Academies. This paper attempts to examine those investigations and their impacts.

Objectives

The major objectives of the research conducted in 1991 were to determine: 1) how successful the academy was in promoting positive environmental growth in the cognitive and affective domain (environmental literacy) of program participants, and 2) whether any cognitive and/or affective changes resulting from participation the academy continued to exist after three months.

The intent of the research conducted in 1992 was to determine: 1) if there was a change in self-concept for program participants; 2) if students' sense of environmental responsibility was altered through participation in an academy; and 3) if there is a correlation between self-concept and environmental responsibility.

Population

Both research studies involved 11th and 12th grade students from Oklahoma enrolled in the OSU Environmental Science Academy (ES) as the experimental group, and the OSU Aerospace Academy (AS) as the comparison group. The 1991 research included 24 ES students and 29 AS students. The 1992 research included 25 ES students and 30 AS students. The two groups had essentially equivalent ratios in age, sex, approximate grade point average, size of home community, and self-declared environmental sensitivity. The participants from both Academies were selected from applications received from across the state Oklahoma. Selection criteria included: 1) membership in an underrepresented minority group, 2) leadership potential, 3) student's letter of application, and 4) academic potential.

Constructs Tested

1. Environmental Literacy: The three components of environmental literacy--attitude, knowledge and action-were identified and correlated.

2. Environmental Responsibility: an understanding of the impact of personal decisions upon society and our environment as a whole, verbal and actual commitment--was identified and correlated to one another and to self concept.

3. Self-Concept: the appreciation one has for one's own identity, worth, and importance. The propensity to be accountable for oneself and to act responsibly toward one's social and natural environment was measured and correlated to environmental responsibility.

Instrumentation

1991 Research: The Ecology Attitude Inventory, developed by Maloney and Ward (1975), was used as it addressed the three components of environmental literacy--attitude, knowledge, and action--and had been tested for reliability and validity. This 45-item survey contains questions in four subscales: affect, which measures the degree of emotionality related to environmental issues; knowledge, which measures specific factual knowledge related to ecological issues; verbal commitment, which measures what a person states he/she is willing to do in reference to environmental issues; and, actual commitment, which measures what a person actually does in reference to environmental issues. Because a study of environmental literacy involves a strong emphasis on environmental action behavior, a second instrument, the Environmental Knowledge and Personal Environmental Action Assessment, developed by Jordan, Hungerford, and Tomera (1986), was utilized.

1992 Research: Two subscales from the Ecology Attitude Inventory, verbal commitment and actual commitment, were utilized to determine students' levels of commitment to environmentally responsible behavior. The Environmental Knowledge and Personal Environmental Action Assessment was administered to provide additional insight into environmentally responsible behavior exhibited by students. Overall levels of self-concept were measured by the Tennessee Self-Concept Scale developed by Roid and Fitts (1989).

Methodology

Quantitative Data: In both studies, a quasi-experimental design was employed utilizing a combination of time series design and a factorial design. The Ecology Attitude Inventory was administered to both groups as a pre and post test. The Inventory was also administered to the ES students as a delayed post test three months after the academy at the reunion weekend. The Environmental Knowledge and Personal Environmental Action Assessment was administered to the ES students as a pre test on the first day of the academy, and again as a delayed post test during the reunion weekend. In addition, 1992 participants completed the Tennessee Self-Concept Scale as a pre, post, and delayed post test.

Qualitative Data: Journals, interviews, parental questionnaires, and student questionnaires were used to further assess the academy's strengths and weaknesses.

Summary of Results

Environmental Literacy research (1991):

1. The ES students showed a statistically significant enduring increase in actual commitment.
2. The AS students showed no significant increase in any component of environmental literacy.
3. Gender, ethnicity, and community size background were not significantly correlated with any component of environmental literacy, with the exception of Anglo students significantly correlated with affect on the pre test.
4. The ES students exhibited a significant increase in environmental action behavior after a delay of three months.
5. Affect was significantly correlated with verbal commitment and actual commitment. Actual commitment was significantly correlated with verbal commitment. Knowledge was not significantly correlated with any other component except on the delayed post test with affect and verbal commitment.

Environmental Responsibility and Self-Concept Research (1992):

1. ES participants exhibited a significant increase in environmental responsibility shown by increases in both verbal and actual commitment.
2. AS students showed a significant decrease in verbal commitment and no change in actual commitment.

3. A significant, positive correlation was shown to exist between the two components of environmental responsibility: verbal commitment and actual commitment for environmental actions.

4. Neither ES students nor AS students demonstrated a significant change in self-concept.

5. Statistically, little or no relationship was shown to exist between self-concept and environmental responsibility. However, qualitative data indicated positive personal growth.

Conclusion

Statistical analyses indicate that significant, positive changes in environmental responsibility and environmental literacy occurred among ES Academy participants. As might be expected no significant positive change existed for AS Academy participants. Although statistically significant changes in self-concept were not detected, academy staff observed many personal changes and have often said that participants "literally grew in front of the staff's eyes grew in maturity, responsibility, self-perceptions, compassion, understanding, awareness, and tolerance." The academy has been successful in not only achieving its stated goals of moving students from "awareness to action," but also in meeting additional affective needs.

The Environmental Science Academy model that stressed actual site visitation, cooperative learning research teams, and information from all points of view toward environmental issues does appear to positively influence the behavior of 11th and 12th grade students. The importance of the findings of the two studies is magnified when we realize that high school participants are now voting members of our society. These findings are also of importance in considering the design and implementation of curricula and programs directed at moving the public toward environmental literacy.

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Using Modules to Infuse EE into the Curriculum

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Introduction

For many years, environmental educators have encouraged teachers to infuse environmental education into the existing curriculum. In some states, like Arizona, laws and regulations require an infusion approach to environmental education. Unfortunately, what all-too-frequently happens is the addition of a few environmental education activities (nature walks, collecting leaves, environmental games, etc. on a Friday afternoon), an environmental celebration (Arbor Day, Earth Day), or, as was noted by Poore (1993), the involvement of students in a single action project (schoolwide recycling, gardening, raising money to save the rainforest).

We believe that a key function of environmental education is to help students learn how to make good decisions about environmental issues. Rowland's (1991) Ways of Knowing and Decision-making Model for curriculum development is based on that assumption and uses a problem solving approach based on steps of: 1) coming to know the problem through the ways of knowing of the disciplines (sciences, social sciences, language, mathematics, the arts, history, philosophy, theology) and personal knowledge; 2) proposing solutions to the problems using the applied disciplines (engineering, management, media, education, health professions, etc.); and 3) using an ethical/moral framework for evaluating the proposed solutions and choosing one for personal action.

For the past several years, we have been working with teachers to develop *environmental decision-making modules* that bring together the content of the disciplines and the decision-making process. These modules allow students to participate in environmental decision-making but only in the context of an understanding of the environmental issue.

What is a Module

We define a module as a chunk of instruction that allows students to come to some conceptual understanding about a concept and/or an issue and to use that understanding to solve a problem or take a position on the issue. A well-planned module includes the following components:

- Introduction-describing the overall purpose and content of the module
- Concept map of the main ideas
- Teacher background information-what teachers ought to know to teach this module
- Student learnings (or objectives)-what students will learn from the module
- Calendar of learning activities
- Lesson plans of learning activities, including appropriate assessment strategies
- Enrichment activities

Developing Modules

We have encouraged teachers to develop instructional modules around environmental/science issues that are of interest to students and have some local implications. A module is developed by selecting a topic or issue and then developing a concept map of the topic. The concept map serves as a stimulus for generating a list of student learnings or objectives. The student learnings then serve as a guide for selecting activities that become the lessons of the module. The lessons are then sequenced based on the Ways of Knowing and Decision-making Model, and appropriate assessment strategies and instruments are developed and inserted in the appropriate places in the module.

If you choose water conservation as a module topic, you first determine what you want your students to understand about water conservation and what knowledge, skills, and beliefs are required for them to understand it. You also need to think about how to ensure that the knowledge will become integrated and useful to them; so the module not only organizes the content of the instruction but also organizes the delivery of the content to maximize student motivation, involvement, etc. The module should hold together such that the learner uses understandings from all parts of the module to deal with a real issue.

Steps in Developing a Module

1. Choose a topic: Although this seems like the easiest part of making a module, it is sometimes fairly difficult to select a good topic. One approach is to look for module topics that are existing topics (or concepts) in the curriculum. An advantage of this approach is that it ensures integration into the curriculum. The downside to this approach is that environmental education is not always clearly present in modules developed in this way. A second approach is to explicitly select a topic that is an

environmental issue. A disadvantage of this approach is that for some teachers, particularly primary, the topic may not fit well into the existing curriculum. Ideally, the module topic should incorporate both approaches by being a concept within the existing curriculum that has an environmental issue embedded within it. For example, a common science topic of "Plants" might have embedded within it a school organic gardening project.

2. Determine the overall goal of the module: Answering the question, "Why is it important for students to learn about this topic?" should generate an overall goal that describes what students should gain from studying this topic.

3. Identify the underlying concepts and make a concept map: Important to any type of curriculum development is an understanding of the subject matter being taught. We encourage the use of concept maps to help clarify the main concepts needed to understand the topic. (See Novak and Gowin, 1984 for information on what concept maps are and how to make them.) Not only do concept maps identify main ideas and show how they are related, but they also serve a very useful planning function. Since the concept map arranges information from the most general at the top to the more specific at the bottom, the bottom of the map implies the activities that need to be carried out to help students understand the more general and abstract ideas at the top of the concept map.

4. Create a list of student learnings: Although you could write traditional objectives at this point, we find it more useful to think about this step in terms of what we'd like students to learn about the topic--thus the words "student learnings." The concept map provides us with a rich set of ideas to consider when creating student learnings. Additional ideas for student learnings may come from local problems, students' interests, or cultural considerations. Student learnings may include skills from a variety of subject areas that you would develop during the module.

5. Start collecting activities: Once the student learnings have been stated, it's time to collect activities that help meet the student learnings. Activities that are collected from commercial sources or national projects can be useful if they are modified to meet the needs of the students. In addition, activities may need to be developed to meet special local or cultural needs.

6. Organize your lessons into a sequence using the Ways of Knowing and Decision-making Model: Once you have all the activities needed to meet the student learnings, you should organize them so that the students go through the sequence implied in the Ways of Knowing and Decision-making Model. First, the students should encounter the environmental issue in an engaging way. Second, they should do activities that help them understand the issue. Third, they should propose solutions or alternative ways of looking at the issue. Fourth, they should make decisions about the issue and take action.

7. Develop assessment strategies that match your student learnings: Assessment strategies should be developed to assess all student learnings. Assessment techniques should be varied but should be appropriate for finding out what students have learned.

8. Develop a set of enrichment activities: Include additional activities that may not be essential to meeting the student learnings but that may provide alternative approaches to them.

9. Write the teacher background information: This procedure begins when you start assembling information about your topic. Take notes about key ideas and terminology throughout the development of your module. Use these notes to write background information that would help the teacher use your module.

10. Write the introduction: Write an overview of the module that describes the main idea of the module, its main goals, and how it will accomplish them.

Summary

The development of *environmental decision-making modules* provides a systematic approach to infusing environmental education into the existing curriculum. By combining the conceptual understanding of issues with the decision-making process, it overcomes the problems of fragmentation that plague many attempts at environmental education.

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STS Issues and Preservice Teacher Education

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Introduction

Pre-service teacher preparation is a complex process involving content acquisition, skill development and philosophical grounding. Methods classes have traditionally focused on the last two areas, attempting to help students develop the skills necessary to teach in today's classes while developing a philosophical grounding for the selection of materials and design of lessons.

Project Synthesis (Harms and Yager, 1981) described four goal clusters as a basis of scientific literacy: personal utility, societal issues, career choice and academic preparation. One implication of these goals is that science education should be directed at more than the prospective future scientist. Science has value for meeting personal needs and helping people deal with science related social issues.

Goals of Science and Environmental Education

Science for All Americans [American Association for the Advancement of Science (AAAS), 1989] also called Project 2061, reinforces this theme of science education including more than science for the scientist. Included in their description of science literacy is the phrase "... and being able to use scientific knowledge and ways of thinking for personal and social purposes" (p. 20). Five criteria are included as standards for selecting concepts to be included in science, mathematic and technology curricula:

- Utility: enhancing long-term employment prospects and/or useful in making personal decisions.
- Social Responsibility: help participate intelligently in making social and political decisions.
- Intrinsic Value of Knowledge: information or skills that are so pervasive or important without which a general education would be incomplete.
- Philosophical Value: contribute to the ability to ponder enduring questions of human meaning.
- Childhood Enrichment: enriching the childhood experience for its own right. (p. 21)

Clearly, science literacy calls for individuals who are not only knowledgeable about the content and processes of science, but can also apply this knowledge to meet personal and societal needs. Of the strategies available to science education both environmental education and the Science-Technology-Society (STS) approaches have much to offer.

The goal of STS education is to help learners develop the knowledge, skills and attitudes needed to take responsible action toward science related social issues (Rubba, 1990). To accomplish this, students rigorously study science related social problems and develop the critical thinking skills necessary for effective participation in democratic decision making (Ramsey,1993).

The goals and objectives of environmental education are complimentary to the STS approach. The Tbilisi Intergovernmental Conference on Environmental Education (1978) defined five objectives for environmental education:

- Awareness: acquire an awareness and sensitivity to the total environment and its allied problems.
- Knowledge: acquire a basic understanding of the environment and its associated problems.
- Attitudes: acquire values and feelings of concern for the environment and the motivation for actively participating in environmental improvement.
- Skills: acquire the skills for identifying and solving environmental problems.
- Participation: provide an opportunity to be actively involved in working toward the resolution of environmental problems.

Hungerford, Peyton and Wilke (1980) stated the superordinate goal of environmental education is, "...to aid citizens in becoming environmentally knowledgeable and above all, skilled and dedicated citizens who are willing to work, individually and collectively, toward achieving and/or maintaining a dynamic equilibrium between quality of life and quality of the environment."

To accomplish this superordinate goal, four goal levels were developed:

- Goal Level I: Ecological Foundations-provide learners with sufficient ecological knowledge to permit him/her to make sound decisions with respect to environmental issues.
- Goal Level II: Conceptual Awareness of Issues and Values-develop the conceptual awareness of how actions influence the quality of life and the environment
- Goal Level III: Investigation and Evaluation-develop the knowledge and skills necessary to investigate environmental issues and evaluate alternative solutions.
- Goal Level IV: Action Skills-Training and Application-develop the skills necessary to take positive environmental action.

In examining the description of science literacy, STS education and the goals of environmental education the common threads of decision making and positive citizen participation are evident. Most environmental issues are one form of science related social issues. Instructional methods that could be applied to accomplish the goal of responsible citizen participation in the resolution of environmental issues should also be effectively applied to promote responsible participation in democratic decision making in regards to science related social issues in STS education. Hungerford, Volk and Ramsey (1990) have described such a strategy, which blends the goals of environmental education and science education into an STS approach to science education that develops the skills necessary for positive citizen participation.

Pre-service Teacher Preparation Southern Illinois University-Carbondale:

Science and environmental education for pre-service elementary teachers at Southern Illinois University-Carbondale (SIUC) consists of two courses. One course focuses on the goals and philosophy of science literacy as expressed in Project Synthesis. In this course particular emphasis is placed on the nature of science and methods of teaching science to achieve the Career Awareness, Academic Preparation and Personal Needs goals of Project Synthesis. The second semester emphasizes methods of achieving the Societal Issues goal of Project Synthesis through STS instruction and the goals of environmental education. The framework of this second course is based on the Goal Levels of Environmental Education described earlier in the paper.

In this course students learn the skills necessary to personally investigate STS issues, propose action alternatives and evaluate consequences of different citizenship actions. Foundation knowledge of the issues is developed through personal research. After personal skills are developed, the emphasis is switched to implementation strategies for the classroom.

This second course has been in place four years. An ongoing effort has been the evaluation of the course's effects on the students. Research questions have focused on: 1) What effects does participation in the course have on students' personal environmental behavior?; and 2) What effects does participation in the course have on the students' perceived ability to help their students become more knowledgeable about STS issues and their perceived ability in teaching their students to become more skilled in investigating and evaluating STS issues and actions?

Results of student surveys indicate positive changes in students' knowledge of STS issues, both in number of issues and in depth knowledge of specific issues. Students also demonstrate increased ability to investigate issues and more critically evaluate alternative citizenship actions. On the personal level, results indicate increases in both individual and group locus of control. Most significantly, students report increases in overt positive citizenship behaviors not associated with class activities.

On the pedagogical side, students report a high degree of perceived ability to help elementary students become knowledgeable about STS issues, develop the skills necessary to investigate and evaluate STS issues and also learn how to become skilled in a range of positive citizenship actions that may help resolve local STS issues.

At this time, studies are beginning to evaluate the rate of implementation of STS strategies in the classroom. Exit interviews with students indicate a high degree of dissonance between their perceived abilities to teach STS investigation skills and what actually happens in the classroom.

Summary

STS strategies can be an important tool in the science education curriculum. Strategies developed to investigate and evaluate environmental issues and actions can be transferred to teach the skills necessary to meet the science literacy components calling for social responsibility and citizenship participation.

A pre-service course developed around the goals of environmental education can change student knowledge, skills and behaviors in regards to STS issues. Students also report changes in perceived ability to teach elementary students about STS issues and citizenship actions skills.

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Organizing and Conducting a Writing Workshop--Some Dos and Don'ts

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Many schools are increasing the environmental content of existing curricula. In response to the need, numerous organizations are providing schools with many types of programs. Many of these materials are well-developed, effective instruction programs complete with objectives, lesson plans, evaluation instruments, and student participatory activities. Mixed in with many excellent programs are some that are not effective at all. According to Hungerford and Volk, "...only a fraction of our young leaders are being exposed to logically developed, well-articulated environmental education programs" (Hungerford and Volk, 1990, 16). Too much of this material is nature study or "doom and gloom" current affairs topics such as the greenhouse effect and depletion of the ozone layer and little is being done to empower students to address the issues and resolve problems (Gough, 1993). Because the American people expect a great deal out of their schools including job opportunities and improving conditions in the future, educators must produce knowledgeable students who will become productive citizens who care about their fellow human beings and the world in which we live (Cawelti, 1993). A continuing issue for educators in the 1990s will be reshaping the curriculum to meet the interest and needs of students (Bushman, 1992).

For curriculum designers the responsibility is clear: environmental education materials must go beyond information and awareness to include behavior change and environmental responsibility. This responsibility is important in the materials development process. One popular way of producing environmental education materials is to conduct a writing workshop, where educators write creative, innovative, new materials that will excite teachers and students while providing an effective instructional product. Effective instructional materials are not, however, always the product generated in a writing workshop. The success of a writing workshop and the final product depends on factors ranging from the qualifications and personalities of the workshop leaders to the site environment and weather.

The following discussion is a comparison of two writing workshops that I participated in and evaluated. Organizers of writing and curriculum reform workshops should find the suggestions both practical and helpful.

Background

Both of the writing workshops had as their goal to write interdisciplinary, environmental materials to supplement the school curricula for grades K-12. Workshop A required materials on six environmental topics and workshop B focused only on water. Both workshops were scheduled for three days and were supported by grant funds. The funds for workshop A went to a consulting firm and a University received the funding for workshop B.

Selecting the Participants

For workshop A participants were selected by the consulting firm from across the nation. The goal was to have each grade level, ethic and minority groups, and major environmental advocacy groups represented. Representatives from some government agencies also were participants. No prior experience developing curriculum materials was required.

For workshop B participants were selected from eight states making up a region. Potential participants were identified to determine their qualifications, availability, and willingness to participate. Nominations were made to the selection committee who sought professionals with experience in curriculum development, teachers with an expertise and interest in water and education, and water resource specialists.

The result of the selection process was some participants in workshop A were not able to work together; some were unsure of how to proceed; and some were more interested in expressing their viewpoint than developing new materials. These conflicts created problems for the organizers that were not resolved during the workshop and caused an atmosphere that was tense and disruptive. Participants in workshop B also had differences of opinion. However, the atmosphere was one of respect for others that made it friendly to express opposing viewpoints and philosophies. None of the participants have difficulty working together.

The lesson for writing workshop organizers is to select participants carefully. Consider the goals and objectives of the workshop. Interview potential participants and check for curriculum development experience, subject area expertise, and educational training.

Preparing the Participants

Both writing workshops sent letters to participants explaining the logistics of the workshop and the financial arrangements. Workshop A organizers sent each participant a hefty pre-workshop box that contained numerous environmental education materials, workbooks, and units from organizations around the country. Workshop B sent a pre-workshop packet that included brochures about the workshop location, maps, participants list with addresses and telephone numbers, tentative workshop agenda, module format and examples, project framework, and a sample activity.

The result was that workshop A participants did not know what to expect and were overwhelmed with the amount of materials sent them to read. Workshop B participants knew what to expect. They had time to read the materials and they came prepared.

The lesson is that most adults want to know what is expected of them and how they can contribute. Organizers should be realistic about what can be accomplished. Pre-planning and preparation by the organizers is important to participants. When the logistics of a workshop run smoothly, there is more time to be creative.

The Environment

Workshop A was held at a luxury motel near a major city airport. All sessions, including lunches and dinners, were held in the hotel meeting rooms. Breakfast was the responsibility of the participants. Although the weather was warm and sunny, there was no opportunity to go outside. Organizers had stated that all expenses would be reimbursed. Some participants were unaware, however, that their expenses would not be reimbursed for eight weeks. The final farewell session was a candlelight dinner.

Workshop B was held at a 4-H camp in a rural setting. Sessions were in the conference center, dining room, and outside, when the weather permitted. All meals and lodging were provided. Because the workshop was regional, most participants paid their own travel expenses. Several participants carpooled. The few participants that needed to be reimbursed for expenses were told it would be four to six weeks. The final farewell session was a pig roast with participants receiving workshop t-shirts.

The lesson here is that organizers should inform participants in advance of selection about the financial arrangements so they will know what to expect and can make a decision about participating based on that information. Workshop organizers should show participants their appreciation with a farewell session that is appropriate to the group, the location, and the type of workshop.

Conducting the Workshop

Setting the proper mood and atmosphere at the beginning of the first session often determines the success of the remainder of the workshop. Each of the workshops began with introducing the organizers and participants.

Workshop A organizers explained the overall project and stated what was expected of each participant. Deadlines for completion of materials by participants was discussed early in this first session. Directions on what was expected and how groups should organize their work was not provided. Participants were divided into grade levels and all groups were expected to outline the subject content for each of the six topics. Writing assignments were decided within each group. All participants were required to return to the group team writer a complete unit of activities for each of the six areas. The team writer was responsible for editing and producing in finished form the work submitted by the other group members.

Workshop B organizers explained the overall project and how participants would be part of the product development. The session began with a water-related ice breaker and continued with a discussion of participants' personal experiences with water. One of the workshop conductors modeled the lesson design process by taking the entire group from brainstorming to product. Computers were set up for word processing units. The session ended with a discussion of what constituted an original idea and participants signing a release form. How people would be acknowledged was stated before any writing was done and there was an understanding of how the materials would be used. Participants also were informed that those participants who created the materials would be the first to see and review them. Participants divided themselves into groups based on the subject area of most interest to them.

The result was that workshop A participants left the workshop with enormous work assignments and short, unrealistic deadlines. Organizers were frustrated that one group even after three days was still unable to determine what they were going to do or how to go about it. Advocacy participants felt their causes had been ignored. Educators felt the organizers should have had some experience in education and conducting a workshop.

Today, more than 18 months after the last lesson deadline was met, the materials have not been produced and the project has been halted. A total of 108 lessons and units sit on the shelf of a consulting firm that has moved on to other projects.

Workshop B participants worked as a team, each member participating and all contributing ideas and approaches to the subject. Most teams found they had more ideas than they had time to develop. Several groups worked late into the night and asked for more time to develop their activities. Participants were highly motivated and wanted to produce the best products they could. The last session was an oral and written evaluation that showed participants were excited about being part of the project. Organizers have kept in touch with all participants over the past 14 months. Workshop materials are being prepared for field-testing.

The lesson is that how workshop organizers conduct their writing workshop will determine how successfully participants produce a product.

A Few Dos and Don'ts

Do select participants carefully with the workshop goals and objectives in mind.

Don't have unrealistic expectations of participants.

Do treat participants as professionals.

Don't leave details to chance.

Do pre-planning and preparation well in advance.

Do create a non-threatening environment.

Don't over schedule. Leave time for fun.

Do state responsibilities and expectations in advance.

Don't set up inflexible criteria.

Do model materials development process.

Do consider the needs and interests of the participants to produce the best environmental education materials possible.

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Wild Learning--An Interdisciplinary Approach to Outdoor Education

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Wild Learning is an interdisciplinary approach based on an on going project developed through the Christa McAuliffe Fellowship and the Chattanooga Nature Center. Wild Learning utilizes a model outdoor educational laboratory (a living lab) and an intensive interdisciplinary unit to facilitate students understanding of life science. It also provides teacher education, and utilizes community resources by providing interaction with the Chattanooga Nature Center.

In today's typical Life Science or Biology classroom, even laboratory based classes, students are not exposed on a regular basis to the real world of living organisms. Their experience, if any, is limited to controlled laboratory activities or short field trips to an environmental center. The challenge of field study is held out as a "plum" for those anticipating careers in science, those taking advanced courses as a part of the "college track", or the affluent in private schools. In order to provide students with the critical thinking skills needed to meet the challenges involved in everyday life, we must change the delivery of science curriculum.

Wild Learning is an alternative to the typical science delivery that came from this project. An interdisciplinary approach was developed with a middle school core team in the subject areas of Language Arts, Social Sciences, Math, and Sciences. Each instructor developed a unit that had an environmental concept. These units were taught as field study units at the Chattanooga Nature Center.

The Nature Center provided two naturalists, Jim Newman (co-author of the living lab concept) and Susie Daffron. The naturalists conducted the Science portion of the units. The Chattanooga School for the Arts and Sciences seventh grade classes were transported to the Center eight times during the school year. These field study classes were rotated through each instructional subject area in a 3 hour block of time with a 30 minute break for lunch and 40 minutes travel time. Each student recorded information in a field study notebook, kept journals in language arts. Many other authentic assessment techniques were incorporated in the evaluation process.

Wild Learning is a program that has become very successful in the Chattanooga City School System and the Chattanooga Nature. The school system has contacted Ms. Smedley to develop interdisciplinary units for a national middle school conference incorporating the Nature Center as an action lab site. The Nature Center has been contacted by many other schools to begin a program such as Wild Learning and the city of Chattanooga has contracted the Center to develop programs for the Greenway Farm. The farm is an environmental area that can be utilized as an outdoor educational facility for the county and city residents.

Wild Learning-An Interdisciplinary Approach to Outdoor Education is becoming a usable and workable method for teaching students environmental education. This approach allows the students to develop a concept that they are a part of the environment not apart from the environment.

Strategies for Change

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Introduction

Helping students see what it is that they and their families do already to help the Earth and its animals gives them a sense of self-esteem--and a base to work from. "Getting to Know You" is an environmental activity that serves to introduce youngsters to one another and helps build appreciation for everyone's contributions. Participants will also be introduced to *KIND News*, the monthly elementary classroom newspaper that teaches about the importance of sharing the Earth.

Strategies and Activities

Developing teamwork skills is vital for today's youngsters who must learn to work together if they are to solve their international environmental problems as neighbors. "The Environmental Spelling Game" is a learning activity that helps students improve listening and spelling skills while developing their ability to work as a team.

The development of critical thinking skills is important in order to help students prepare for tomorrow's environmental challenges. "Who is Sherman?" gives students practice in analytical thinking as they deduce what animal Sherman is by eliminating what he is not. The activity also illustrates that every animal--even one as small as Sherman--has a role to play in nature.

Further practice in analytical thinking is provided by the activity "Let Me Stay Free" in which students are encouraged not to make "pets" of wild animals. We have all seen the effects of removing animals from the wild. Nature centers become the last repository for fledglings at springtime; for raccoons, skunks, ferrets, and other animals whose "owners" got them as babies and no longer want them when they are grown. Given the realities of urban sprawl, most kids today seldom see wild animals. We cannot expect them to appreciate something they scarcely ever encounter, so taking wild animals to the students often seems justified. But while appreciation-building is the intent, the effect may be to encourage kids to capture animals from the wild, promoting a use-oriented attitude toward nature. In effect, we are saying, "do as I say, not as I do." This activity helps students understand that caring about wild animals often means leaving them alone--and not making "pets" of them.

"Endangered Species Startling Statistics" gives students practice in hypothesizing while improving math skills and knowledge about endangered animals. Students practice creative "guesstimating" while being exposed to some startling statistics about the loss of species around the world. The activity can serve as a springboard for discussion of some of the more subtle ways in which human actions can affect animals. Habitat loss figures significantly in the endangerment of many species. Students need to understand that, in many cases, protecting endangered animals means protecting the places where animals live. While students in the upper elementary grades may grasp the concept that animals need habitat, they may be less likely to comprehend the extent to which human actions can result in loss of habitat. For instance, in developing nations, the construction of a new hydroelectric dam brings with it the flooding of hundreds of square miles, destroying large numbers of animals whose habitat is forever lost. Conservation and energy efficiency, on the other hand, can obviate the need for new energy-producing plants, thereby benefiting people as well as animals. Yet, for many students, the connection between hydroelectric power and loss of species may not be obvious at first glance.

The rain forest is an example of a severely threatened habitat. Home to millions of plant and animal species, the rain forests of the world are being obliterated at an alarming rate. We are only beginning to understand the implications of their loss. Students learn some fascinating rain forest facts as they engage in critical thinking, recall, and analysis in the activity "Rain Forest Gift or Gaffe."

The Use Of Field Research In Environmental Education

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Why Do Field Research?

Faced with a large number of difficult ecological problems, our society must require science students to become creative problem solvers. Students in fields other than science need to become scientifically literate in order to understand how resource management decisions are made. Several years as an environmental educator, a high-school science teacher, a graduate student and eventually a career as a scientist has lead me to believe that we are not preparing students to understand the complexity of environmental problems, nor are we giving them the skills needed to solve them. We do not require our science teachers to be scientists and few environmental educators are trained as scientists. So how can environmental education programs incorporate field research into their curriculum?

As a high-school science teacher I had wanted to take my students out into the field. I wanted them to investigate any number of features and questions that arise in nature, but I lacked the experience to guide their questions in a meaningful way. This paper, and a book of similar title, could only have been written after several years as a scientist after I developed a familiarity with the scientist's tools. And then, I had to share these tools with students and watch how they learned before I could write a book for teachers about how to engage students in field research.

Field research rarely is mentioned in many science courses. The subject matter of environmental education usually consists of what natural history we know, and what we think we know about ecological paradigms, pollution effects and resource management practices. Without a research experience in environmental education programs or in our schools, students must have the impression that field research is done by the Marlin Perkins (Mutual of Omaha's Wild Kingdom) and the Marty Stouffers of the world for the benefit of TV audiences. In fact, field research is done by many people, often to solve very real environmental problems. Field research need not be left to those with advanced degrees or TV programs (and budgets). A few simple learned skills and techniques are all that is required to open a window on a whole new world of teaching and learning.

Environmental educators can easily learn the techniques of field data collection, data analysis and how to design a research project in which students can participate. Somewhat more difficult, though not much more, is the skill of asking a research question from which the research project evolves.

Why not just teach about it?

The use of the phrase "hands-on" has become a cliché when the value of experiential learning is discussed. "Hands-on" learning is not all that we are after, however. The phrase implies that "doing" begets learning. Or that by doing something one is able to learn better than by simply learning "about" something second hand. This is too simplistic. We give the student something to do; they learn. Perhaps they do not learn all they could or should. Field research experiences challenge students to decide for themselves what they need to learn to answer a research question. This means learning the processes involved in problem solving rather than solely seeking the solutions to the problems.

This is a risky business. When students undertake to design field studies they may not learn what we intend for them to learn. Teaching strictly within our structured classroom methods is a predictable exercise. We can evaluate and control the outcomes. It is much more difficult when we do not even know what the outcomes of an experiment or a research project are going to be. When students have a chance to formulate their own questions and to design the methods for answering them, then we give up a certain assurance that the desired outcomes of a lesson are going to be achieved.

That's not to say that field research is without a structure or direction. There is indeed a well-defined structure and organization involved. However, the teacher who uses field research projects as a teaching tool gives up a certain amount of control. The control, the focus and the organization are yielded over to the project, or to the problem itself. The teacher becomes more of a *facilitator* rather than the *source* of learning.

I use the acronym "F.O.C.U.S." to describe some of the values in doing field research with students:

F. Research provides a very *focused* approach to learning that captivates and motivates students. Once a student becomes directly engaged in solving a problem, his/her learning continues rapidly and in a directed fashion. A great deal of basic biology can be taught in the context of a field research project when students feel the necessity for knowledge.

O. The key to any research program is that students know that their ideas are their own creation; that the results they gather are *original*. They should know that no one has ever done precisely the same project, experiment or study before and that the results will therefore be useful and important.

C. A research program develops *critical thinking skills*. Too often, the nonscientist believes that science is perfect and beyond failure. We rely upon the "experts" to tell us what is "what," when in fact science is done by humans and humans are imperfect. They make mistakes, they are misled by false assumptions and they each have their particular biases. Research programs demand that the assumptions and biases associated with a particular problem be examined scrupulously. It is essential that a student be asked to identify these limitations of a research project.

U. Research learning *uses the students' own experiences* rather than instructing through abstract ideas and "stories."

S. Field research develops a sense of *stewardship* by challenging students to use the results of a research project to manage the natural resources they are studying.

Stewardship and teacher bias

As natural environments come under siege each citizen should feel a responsibility to make changes in his or her lifestyle that will alter and reduce this trend. These lifestyle changes and responsibilities of citizenship are often referred to as stewardship. Stewardship is a conscious effort to preserve the systems of life support that we depend upon. If we attempt to give students our opinions about the state of the world, the environment, or a stream subjected to pollution however, we may influence students with our own biases.

We can tell students based on our beliefs or knowledge that doing "this" or "that" to a forest, meadow, lake or stream will have "this" or "that" effect and they may or may not believe us. They may or may not act upon this belief or new knowledge to make a change. However, a student who has seen first hand, through scientific investigation and examination what the effects of pollution on a stream are, is far more likely to act on that knowledge.

At the Teton Science School I have seen groups of junior high, high-school and college students present the findings of research projects to senior-level employees of the United States Forest Service, National Park Service, United States Fish and Wildlife Service, Soil Conservation Service, State Game and Fish Departments and other agencies with astonishing results. Often the students were not only able to show that their results were scientifically valid, but occasionally they made an impact on the way local natural resources were managed by these same agencies. And students learned first hand what the impacts of land uses were on the natural systems they were studying.

An example may be useful here. A group of students at Teton Science School examined the influence of post-forest-fire management practices on revegetation. Several options about how to manage the areas that were burned were being weighed by USFS and NPS managers. Among the options under consideration in the National Forests were to "salvage cut" the usable but burned timber, to replant, or to allow natural regeneration. Through their week-long research effort, these students demonstrated that salvage cutting stimulated seedling regeneration but inhibited the growth of other vegetation.

I use this example to show that had my own biases about the positive or negative influences of logging been shared with the students, it could not have compared to the quality of learning that took place through a field research project, one that clearly demonstrated the results of each management practice. Under conditions that might cause severe soil erosion or where quick ground cover regeneration is desirable salvage cutting would not be recommended. On the other hand, where forest regeneration is preferred, salvage cutting is a more desirable option.

The following philosophy seems to embody what now has become a familiar pattern among many such students: Our goal should be to not only learn by doing, but to do what we are learning.

Student Energy Patrol--An Action Program

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The Energy Patrol provides an easy-to-implement action program for students. Through participating in this program, students apply their classroom learning about energy to gain practical knowledge about energy use problems. Students gain the satisfaction of knowing that they can develop strategies and solutions that result in energy conservation and monetary savings at the school site, as well as contribute to the environmental health of everyone.

The Energy Patrol has been enacted by local schools, in four counties in Southern California, who have been cooperating with the Energy Extension Center at California State University, San Bernardino, in a comprehensive energy management program. The major function of the Energy Patrol is to monitor the energy usage at the school, analyze the results, propose ways to save energy, and reward the participation of students and teachers. Usually the Energy Patrol monitors the classroom energy use at recesses and lunch using a checksheet to record information. The students document any excess energy use, usually being that the lights are left on while no one is present. A notice is left to thank the class for leaving the lights off, or a reminder notice is left to encourage future energy conservation.

At the beginning and end of each school day, the school's electric meter is read, the information recorded in a computer data base, and the daily usage calculated. Students meet on a weekly basis to analyze data and to discuss conservation strategies. As a result, a wealth of new action strategies can be generated which complement and extend the Energy Patrol's initial efforts. Some of the outcomes have included: presenting assemblies to other students; sponsoring a month-long energy awareness theme; writing articles on energy conservation for the monthly parent newsletter; starting a recycling program; teaching energy lessons to younger students and encouraging them to earn a "Junior Energy Saver" award.

Energy conservation, with at least a 10 percent reduction, has been achieved through the efforts of the Energy Patrol students. This results in thousands of dollars saved each year per school. The actually energy and money saved are verified by the university's Energy Extension Center.

Students have applied their energy saving efforts to developing an understanding of how their actions are saving Planet Earth. For every $100 in energy savings, one ton of carbon dioxide, a greenhouse gas, is not contributed to the atmosphere. Turning out the lights when a classroom is unoccupied saves the addition of 120 pounds of carbon dioxide.

The Energy Patrol enables students to achieve a more responsible environmental attitude that is reflected in their actions. Students acquire knowledge of action strategies and actually experience that their own actions can make a difference. It appears to educators who work with the Energy Patrol program that the participating students improve their self-concept and self-esteem, apply critical thinking skills, develop moral reasoning, and demonstrate citizenship skills.

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Acid Rain, Air Pollutants and Global Change

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Our Chemical Climate

We depend for survival on "an ocean of *air*," which has currents and variations in temperature and pressure. Terrestrial plants and animals depend completely on the atmosphere not only for oxygen, but for other important chemicals. For example, plants must have carbon to manufacture complex sugar molecules. They obtain it by taking atmospheric carbon dioxide into their leaves. Similarly, plants take in nitrogen, the building block of cell matter, through their roots after it is deposited from the air onto the soil. Altogether, plants use 16 atmospheric chemicals as nutrients. Next time you look at a towering tree, consider that much of the tree was built literally "out of thin air." Animals obtain these carbon and nitrogen-containing compounds from plants, either directly or indirectly. Herbivores, such as deer, obtain them by eating plants. Carnivores, such as wolves, obtain them by eating herbivores.

Air Pollutants. Acid Deposition, more commonly known as "acid rain," is a "secondary pollutant"-not emitted directly, but created from the reactions of pollutant "precursors" in the atmosphere.

Carbon Monoxide. This colorless and odorless gas is a by-product of incomplete combustion, of greatest concern in urban centers where it is produced by heavy automobile traffic.

Nitrogen Oxides. These gases are produced in high temperature combustion. Automobiles are a major source of nitrogen oxides and may form acid deposition.

Ozone and the Other Photochemical Oxidants. These gases are "secondary" pollutants, not emitted by any vehicle or factory. They are formed in the atmosphere by the reaction of volatile organic compounds, nitrogen oxides, oxygen, and sunlight. Other polluting photochemical oxidants include peroxyacetyl nitrate (PAN) and peroxyproprionyl nitrate.

Particulate Matter. Virtually any pollutant in solid form falls into this category. Particles can range from large bits of soot to microscopic particles, called aerosols, formed by condensation of vapors in the atmosphere.

Sulfur Dioxide. A colorless gas, sulfur dioxide is produced during combustion of fossil fuels (such as coal and oil) and metal smelting. In Europe and North America, acid formed from sulfur dioxide is the major component of acid deposition.

Toxic Elements. Include fluorine and heavy metals such as lead, cadmium, nickel, and mercury. Principal sources are large metal smelters and leaded gasoline.

Volatile Organic Compounds. Include a wide range of compounds, from gasoline vapors to solvents to pesticide fumes. These compounds, together with nitrogen oxides, react with sunlight and oxygen to produce ozone.

Effects on Human Health

Six pollutants measured by EPA have proven or suspected effects on human health: Carbon Monoxide. Carbon monoxide interferes with blood's ability to deliver oxygen to bodily tissues. It weakens heart contractions. High levels of carbon monoxide are considered harmful to everyone, but especially to those with heart disease, respiratory disorders, and anemia, and to cigarette smokers (who already inhale doses of carbon monoxide while smoking). Research has shown that even lower levels of carbon monoxide can have minor but measurable effects on vision and alertness.

Lead. Lead can accumulate in the blood, bones, and soft body tissues when inhaled. The body cannot easily remove lead, and it accumulates, eventually harming the kidneys, nervous system, and the blood-forming organs. Infants and small children are susceptible to brain and nervous system damage.

Nitrogen Oxides. Like many of the other primary air pollutants, nitrogen oxides can irritate lungs, pneumonia and bronchitis and lower the body's resistance to respiratory infections.

Ozone. Ozone can cause severe irritation of the nose and throat. It can impair lung function, and can be especially harmful to those with chronic lung diseases, as well as those with asthma or heart and circulatory system conditions. In combination with sulfur dioxide, it has more severe health effects than either pollutant would have alone.

Particulates. Inhaled particulates can irritate the respiratory system (lungs, throat, and nasal passages). Repeated and prolonged exposure to some types of particulates increases the likelihood of chronic respiratory disease.

Sulfur Dioxide. Sulfur dioxide is linked to increased respiratory ailments. Studies show increased death rates among sufferers of heart and lung illnesses during periods when there is high sulfur dioxide content in the atmosphere. Once sulfur dioxide is emitted from a smokestack it reacts with various chemicals to form other sulfur-containing compounds, including microscopic aerosols of sulfates and sulfites. Research suggests that some of the compounds may be more harmful to health than sulfur dioxide alone.

Acid Deposition

Before the 1970's, the term "acid rain" was almost unknown. But since 1979, it has moved to the forefront as a major air and water pollution concern. Scientists prefer the more accurate term "acid deposition," since acidity can travel from the skies to the earth in many forms: rain, snow, sleet, fog, or even as tiny particles or as a gas.

Unnaturally high amounts of acid deposition in North America are caused primarily by emissions of two pollutants: sulfur dioxide and nitrogen oxides. Two-thirds of acid deposition in the eastern US is associated with sulfur dioxide, the remainder with nitrogen-containing compounds. In the West, half or more of the acidity is associated with nitrogen oxides.

Dr. Derek Winstanley, Director, National Acid Precipitation Assessment Program, quoted by the New York Times, September 1993: "Sulfur dioxide emissions have declined about 30% nationwide since 1970 when the Clean Air Act was passed in an attempt to improve air quality." In the case of sulfates, significant declines have been recorded in 26 of 33 sites monitored from 1980 to 1991 by the USGS. The concentration of nitrates have not declined and are predicted to increase after 2000.

The Acid Rain Control Program, created in 1990 by amendments to the Clean Air Act, calls for further reductions in sulfur dioxide emissions from stationary sources, which by the year 2000 will be capped at about 25 million tons a year, 42% of 1980 levels. Emissions reductions of about 9 million tons are to be achieved by the nation's power-generating utilities while steel plants and other factories will account for another 5.65 million tons.

The Greenhouse Effect

The earth may be getting a dose of too much of a good thing: carbon dioxide. Plants use carbon from carbon dioxide in the air for photosynthesis, a process which builds energy-storing molecules. But human activities-industry, automotive traffic, and energy production-may be overloading the atmosphere with carbon dioxide, an inevitable by-product of combustion. With worldwide proliferation of fossil-fuel energy sources, carbon dioxide is building up in the atmosphere. Scientists have recorded increasing levels of atmospheric carbon dioxide at Mauna Loa, Hawaii--from 315 parts per million in 1958 to about 345 parts per million in the mid-1980s.

Increased carbon dioxide prevents some heat that otherwise would be radiated out into space from leaving the atmosphere, just as the windows of a greenhouse let in sunlight but hold in heat. This causes a worldwide warming trend over many years. Although the average increase might only be a few degrees, it could have major effects on world climate--possibly melting portions of the polar ice caps, raising the sea level in coastal areas, and changing rainfall patterns, shifting the location of some productive agricultural regions.

Other compounds such as ozone, methane, nitrous oxide, and several types of chlorofluoro-carbons are believed to hold in heat in the same way as carbon dioxide. Much remains to be learned about the greenhouse effect. It is possible, for example, that some of the excess carbon will be absorbed by plants, or carbon dioxide fertilization, cause increased growth in some species and relieve the problem. However, it is also possible that if the oceans begin to warm, their capacity to hold carbon dioxide will diminish.

Scientists presently have too little information to understand fully what the net effect will be, or how soon problems could develop. It is safe to say that any significant global warming could cause major, worldwide disruption weather patterns, waterways, and agriculture, and loss of some coastal resources

What We Are Doing at NCSU in Curriculum and Teaching Strategies

The SCI-LINK Project-Scientists, teachers and students. Scientists performing current environmental research present their information, techniques and methodologies to teachers. Teachers, on computer, develop hands-on activities to be used in their own classrooms in life, earth, physical sciences, biology, chemistry, physics, and environmental science. Teachers teach the activities they themselves develop (100%). These activities may address only a small portion of the scientist's research and ongoing curricula. But, new information is taught by teachers who have attend the Institutes or workshops.

The GLOBE-NET Project-Curriculum Development (SCI-LINK). There are many more steps and people in the GLOBE-NET process. The finished activity receives reviews by scientists, teachers, and students. The evaluative process is involved; many changes are made along the way. Technology has made a major difference in the development and cost-effectiveness in the process of curriculum development.

We must examine many different ways of transferring information to the classroom. Classroom activities developed by the teacher, plus background information of audiovisual materials, hard-copy printing, computer programs and software, and bibliographies for both teacher and student are essential.

We have developed a strategy and dissemination mechanism for current environmental research to reach classroom teachers, and ultimately students. We continue to clarify and modify our strategies, techniques, and methodologies to achieve a more efficient, cost-effective process.

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Project CEED--Using Wetlands to Understand the Connection Between Jobs and the Environment

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Louisiana's coastline contains 40% of the coastal wetlands of the continental United States. These enormous wetlands have and will always define the state's culture and economy. They are a major part of the lifestyles of Louisianians, being the place they recreate through fishing, hunting, boating, and escaping to their camps.

These valuable wetlands are disappearing at a rapid rate, currently 35 sq. mi. per year (50 sq. mi. per year between 1956 and 1978).

It is obvious that we will not save our ecosystem until the populace is educated about its value. Project CEED (Coastal Education for Economic Development) has taken two approaches: 1) to link citizens' economic well-being to a healthy coastal wetlands ecosystem; 2) to focus its curriculum on "teacher friendly" methods, i.e., educational methodology with which they feel comfortable rather than loads of facts.

There is always a certain percentage of the population that becomes interested in saving habitats purely for that habitat's natural values. We long ago saturated that following in Louisiana, so we have had to appeal to different needs of different audiences.

If there is one universal need of all citizens in south Louisiana, it is to maintain the economic values that accrue from the existence of healthy coastal wetlands. Project CEED was developed to meet that need. The concept is that if people realize that their livelihood is dependent upon a healthy coastal ecosystem, then they are more likely to protect that ecosystem.

All environmental educators use food webs as part of their instructional strategy. Food webs are excellent illustrations of how all parts of nature are interconnected; to paraphrase John Muir, if you pull on one little piece of nature, the rest jiggles. Project CEED couples food webs with another interconnection, that of the **economic web**. An economic web simply shows the economic interrelatedness of human endeavors. A school teacher buys shoes, pays taxes, buys gasoline, pays for utilities, has insurance, etc. Each of the people that teacher does business with does the same. One can combine food and economic webs by studying how certain commercially important marine species are tied to the health of the coastal marshes. If the marshes disappear, the marine species disappear. If the latter disappear, all the jobs associated with their harvest and production for market disappear. It doesn't take an environmental scientist to figure out that if the marshes go, so do ship builders, net makers, seafood distributors, etc., including all the people they have spent money with such as insurance brokers, teachers, shoe salesmen, tax collectors, and more. We illustrate this by using our essay, "The Marsh Bone is Connected to the Chicken Bone," showing how the chicken industry is dependent on coastal marshes.

Yes, this approach is anthropocentric, but we recognize that the masses make their decisions based on their and their family's needs. If they are comfortable and have time and resources, they then have the luxury of being environmentally active.

Through our teacher inservice workshops in Louisiana and several other states and literature review, we found that few elementary teachers had an adequate background in science, yet they are all required to teach the subject. We also found that virtually all teachers were conversant with basic educational methodology. These facts led to the educational philosophy of Project CEED. We use the educational process, rather than a compendium of wetlands facts, to stimulate teachers to educate their students about the wetlands. Because teachers feel more familiar with this approach, they are more likely to teach their pupils about the wetlands.

The teaching strategies that we use include Bloom's Taxonomy (a hierarchical system of applying knowledge), Taylor's Multiple Talent Approach (allows students with differing talents to learn and apply information), Concept Mapping (visual diagraming), Poetry, Journal Keeping, Guided Imagery, SCAMPER (the use of idea-spurring questions to stretch thinking), and more.

The use of these techniques accomplished another goal. The variety of activities allows Project CEED to reach students with different learning styles.

The use of this methods approach may raise the question, "Are the children getting important content?" We were careful to identify the most important issues in the Louisiana Coastal Zone, then reduce them to easily understood examples. We believe that students who have used Project CEED materials will have been exposed to the most important issues confronting our (indeed, virtually all) coastal ecosystem.

Minnesota's 1993 State Plan for Environmental Education--An Outcome Based 10 Year Strategy Building from a Greenprint-Minnesota's Environmental Education Plan

Barbara Toren, Chair
Environmental Education Advisory Board
State of Minnesota

In June of 1993 a new chapter for environmental education in Minnesota began. The journey started over twenty years ago with the formation of the Minnesota Environmental Education Board. That board planted the seeds for this type of education through-out the state. Those seeds began to take root, interweaving with each other helping to avoid erosion of that organization's fine work.

In 1990, the Minnesota Legislature passed into law the EE Act, which created the Office of Environmental Education along with a seventeen member Advisory Board. Included on this Advisory Board along with eight citizen members are representatives from Minnesota's Department of Natural Resources, Pollution Control Agency, Department of Agriculture, Minnesota Planning, Board of Water and Soil Resources, Department of Education, Higher Education Coordination Board, Board of Teaching, and Minnesota Extension (University of Minnesota). Those interweaving roots planted over twenty years ago were beginning to sprout.

This new organization was charged by the legislature to develop a plan to help citizens and groups to achieve the goals outlined in the legislative mandate of 1990. Funding was provided by the Minnesota Legislature upon recommendation by the Legislative Commission on Minnesota Resources for the development of a state environmental education plan. Four other associated projects were also recommended for funding at that same time, they are:

Curriculum Planning for K-12 Education
Community Education
A Study of Environmental Education Centers
Environmental Education Centers Program Study

Recommendations from these four associated projects were taken into account as the Greenprint was being developed and written.

To develop the plan, Office of Environmental Education staff and Advisory Board met for over two years with hundreds of people from all over the state through task force meetings, regional meetings and two state-wide Conferences. Technical advisory meetings were held to bring natural science and formal educational expertise to the growing plan.

These meetings were rewarding as it became very clear that members of the public wanted to contribute to the planning process and to be part of Minnesota's future; and were able to make significant contributions to the plan.

A first draft of this plan was introduced last November, and received much additional public comment. The final draft was sent out in April of 1993. Ten public forums took place, again to draw public comment. During that time the Advisory Board moved into the hi-tech world by utilizing the tele-conference facilities at Willmar, St. Cloud, Brainerd and Pine City colleges for interactive public meetings.

After having inventoried what has happened in the field of environmental education here in Minnesota and other places and sorting out the volumes of notes from those two years of meetings along with comments generated from the Drafts, we have completed a most daunting task, but most worthwhile. A Greenprint for Minnesota: State Plan for Environmental Education was unveiled on June 24, six days ahead of the June 30th legislative deadline.

I would like to describe some of the contents of this comprehensive plan. In it there are recommendations to the Minnesota Legislature for program funding at the level of 6.7 million per biennium; a recommendation of Bonding Authority for residential Environmental Education Centers; and policy direction such that:

- The Legislature should develop and communicate a statewide environmental mission.
- The Legislature should provide leadership in identifying state priority environmental issues.
- The Legislature should develop guidelines for environmentally sound behaviors.

In the Greenprint the EE Advisory Board identified ten Audiences for environmental education and listed them in priority order, based on their direct impact on natural resources; and their influence in modeling behavior to others.

These Audiences are:

Pre K-12 Students
Higher Education Students
Government Officials and Board
Consumers
Producers/Landowners
Regulated Community
Business Community
Outdoor Recreation Resource Users
Citizen and Youth Groups
Religious Groups

Identifying these specific groups is an important feature of the plan. Many people attended individual audience meetings giving particular attention and particular consideration to each audience because environmental education is not the same for all groups.

The Greenprint is an action plan which looks for results. Results which show measurable behaviors that demonstrate an understanding and knowledge of people's interconnection with the natural world. It is an "outcome based" environmental education plan. Sample outcomes, indicators, needs, partnership opportunities, and strategies for implementation are listed for each of the ten audiences.

The Greenprint describes the status of the public and private funding sources for the varied providers of environmental education, and related activities, programs and materials. The plan gives a brief description of the environmental programs, activities, and resources available through-out the state. Environmental educators are urged to work in partnership with the varied groups.

The EE Advisory Board urges that agencies, organizations and environmental education programs be sensitive to the cultural diversity of the Minnesota. Programs should draw from the rich traditions of our multi-cultural populations. Educators should assure access for people of varying abilities.

The Greenprint promotes the idea that citizens, agencies and organizations should work in partnership with each other. It is going to help facilitate many existing state agency education programs which are being carried out right now.

This plan is designed to be evaluated and updated over the next ten years. During that time the EE Advisory Board will be collecting information on the progress made toward achieving its goals. Periodically the Advisory Board will compare the stated "outcomes" in the plan with the real world.

Response to the Greenprint has been extraordinary in my experience with Environmental Education. We have received hundreds of requests from all over the United States and Canada. The Greenprint was recently featured at the conference: Education for All-Education Needs for Central and Eastern Europe, held in Poland.

In August, EE Advisory Board authorized a second printing of the Greenprint so that a copy could be placed in each of the 369 public libraries and 655 public school libraries in Minnesota, and mailed to 2300 environmental education contact persons in schools throughout Minnesota.

For Environmental Education in Minnesota a solid root system is in place, the new growth that sprouted in 1990 is now coming into bloom. As the plan is used we expect to see it bear an abundant harvest over the next ten years and on into the future for the benefit of all citizens of Minnesota.

Multicultural Perspectives in Early Childhood Environmental Education

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Experiences during the early childhood years have the potential for influencing life-long attitudes and behaviors (Wilson, 1993a). It's during these early years that children begin to discover who they are in relation to the world around them (Hostetler,1990). Two major dimensions of this world are other people and the natural environment. The attitudes and behaviors, we, as individuals and as a group, develop in relation to these two dimensions have major implications on the survival (and/or quality of survival) of not only the human species, but of the planet itself (Lane, 1993; Wilson, 1993a).

Both the natural environment and the community of people display great beauty and diversity. These qualities, however, aren't always recognized and appreciated (Clark, 1991; McCracken, 1993). Early childhood environmental education presented from a multicultural perspective has the potential for enhancing awareness and appreciation of both the natural environment and the diversity within the human community. It also has the potential for fostering peace and harmony between groups of people and between people and the world of nature (Clark, 1991; McCracken, 1993; McFarland, 1991).

At the present time, both early childhood environmental education and multicultural education are in their early stages of development. A close look at each of these newly-developing disciplines suggests that there are some common threads and overlapping concepts and resources (McCracken, 1993; Wilson, 1993b). Based on these commonalities, an argument can be made for a deliberate integration of early childhood environmental education and multicultural education.

One way to infuse multicultural perspectives into an early childhood environmental education program is through the use of stories. By using stories based on myths and legends, we can tap into the beliefs and thoughts of ancient peoples. Before the invention of the written word, people sang their stories, danced them, carved them in rock and wood, and painted them on the walls of their dwellings. Their stories often expressed their understandings and feelings about the natural world. Because young children see the world through eyes very much like those of our ancient ancestors, they tend to relate well to myths and legends (Harmon, 1992).

After a story is shared, a variety of activities can be used to extend the learnings introduced in the myth or legend. Involving children in active dramatic play is one example of how this might be done. An outdoor area can be converted into a "theater." This might be a large dirt or grassy area, a sandbox, the corner of a garden or even a wading pool filled with dirt or water--or left empty. Through music, song, and dance, the children actively participate in the reenactment of the stories. They may act or dance the story itself, or create a new myth.

Arts and crafts can also be used to extend the story. Using the colors, shapes, and textures of natural objects and recyclable household articles, a child can conceptualize the characters and actions of a story, depict it in a three dimensional object, and then stand back and see that it is real.

Finally, discussions with adults can help children grasp the meaning of myths and legends. Through the stories, along with the follow up activities and discussions, children learn the lessons the stories have to teach--stories about sharing, friendship, cooperation, empathy, problem solving, creativity, harmony with nature, individuality, and self esteem.

One place where a multicultural environmental education is being implemented with young children is The Young Naturalist Center in Studio City, California. The focus of the program is on integrating non-violent problem solving with earth ethics and multicultural environmental education. The curriculum invites children to discover how other cultures have lived, and still live, in harmony with the earth. Storytelling, singing and dancing, listening to myths and legends about living things, craft-making, and dramatic play are all interwoven throughout the day to enhance the child's self-esteem, emotional and social development, and understanding and appreciation of the world in which they live.

The Young Naturalist Center provides a stimulating and safe place for young children. It's an environment in which children learn to interact and become at one with the four basic elements of the planet--earth, fire, air, and water. It's a place where children are encouraged to stay in touch with their inborn sense of wonder--a sense that provides the impetus to explore the world around them (Carson, 1984) and, thus, to discover the interdependence of all things in, on, under and around the earth. They come to understand and respect all aspects of their environment--including that which is animal, vegetable, mineral, and human.

The program at the Young Naturalist Center reflects a concern for the physical, emotional, and spiritual well-being of present and future generations. It seeks to educate young children in ways that preserve their natural heritage and, at the same time, prepare them for the realities of life in a complex, interrelated world. In an effort to keep the program relevant to the children and their families, parents, teachers, and the community are considered partners, or co-creators, in developing the curriculum. Local community members research, design, and share culturally relevant ideas and materials with the children and teachers at The Young Naturalist Center. The resulting curriculum helps young children adjust to and live both in the traditional world that honors the diverse cultures of ethnic peoples and the modern world with its pressing problems of survival (Harmon, 1992).

Children who come to the Young Naturalist Center soon come to regard the Center as "theirs"--a place where they are in harmony with nature, each other, and the few adults who are privileged to be their guides. The young children perceive themselves as caregivers and students of the earth and all its creatures. They learn that what they do to the natural environment affects how they treat themselves and each other.

The overall goal of the Young Naturalist Center is to bring together people who envision a world without racial and cultural barriers, while creating an appreciation and understanding of the rich and diverse gifts they all bring to the human family. The curriculum designed to accomplish this goal blends environmental, holistic education with the spiritual knowing that has kept traditional cultures alive and in touch with the natural environment for centuries. Ideally, a child's experiences at the Young Naturalist Center will instill a deep sense of personal harmony that not only sees the possibility of a peaceful world, but can make that vision a reality (Harmon, 1992).

Dr. Marti Harmon, founder and director of the Young Naturalist Center, invites visitors and requests for more information. Dr. Harmon is also available as a consultant for teacher training and collaborative curriculum development, especially as these relate to multicultural perspectives in early childhood environmental education. A successful prototype for this community-based, interdisciplinary curriculum for early childhood environmental education among culturally oppressed populations was implemented with the Rosebud Sioux Nation in Rosebud, South Dakota. Efforts are underway to expand this innovative educational framework to other "endangered" communities, both in the United States and abroad. The goal of this project is to co-create, with local teaching partners drawn from the community's elders, medicine people, storytellers, artists, etc., a holistic, interdisciplinary environmentally sensitive education which instills both the spiritual values necessary for emotional and social growth, and the intellectual curiosity which make learning a wondrous adventure. To participate in this initiative, or for further information, contact Dr. Harmon at the Young Naturalist Center, 12725 Landale Street, Studio City, CA 91604. Phone 818/761-3008.

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A River Runs Through It

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The Vision

The overall objective of this curriculum will be for students to leave the center with an environmental ethic, an understanding of the connection between the choices they make daily and environmental problems, and more skilled and committed to taking actions to improve their environment. We have chosen the theme "A River Runs Through It," not only because the Cuyahoga River is the centerpiece of the park, but because it physically links the center with the communities which it serves. We believe it is crucial that the experience at the resident center not be disjunct with the students' experiences in their home environments. The river provides a tangible connection. Pre and post-site activities help students make that connection and integrate the center experience with the school curriculum as a whole.

The river also provides a core theme around which to build multi-disciplinary, multi-cultural activities sewing the curriculum together into a coherent whole. Although this curriculum will be unique in many ways, its emphasis on the arts will particularly set it apart from other curricula. The Arts Educational Theatre Company in Cleveland, and Ohio State University are partners with us on this project.

The Cuyahoga River has been the pivotal resource in the development of this region. Infamous for "catching on fire" several times, this river has been sorely abused in the past, and has lingering serious problems, albeit not as visible. By developing a base of knowledge about the river and helping students acquire tools for expressing themselves and being involved in action, they can be empowered to help work to solve these problems.

Since there are rivers all over the world, the river theme will also help us give this curriculum a global perspective. At the center students learn about other rivers and interact via computer with students studying them. Since this river theme is universal, any National Park, environmental education center or school with a river, stream or lake nearby will be able to adapt this curriculum to its needs.

Key characteristics we incorporated in this curriculum are:

1. Interdisciplinary Approach.

From its defining moment at the UNESCO-UNEP Intergovernmental Conference on Environmental Education at Tbilisi, Georgia the field of environmental education has been identified as an interdisciplinary one. Few programs, however, have lived up to this lofty vision. Resident programs in particular still tend to emphasize nature study. Where other disciplines are involved, they are usually ancillary, and separate offerings. For instance, there may be arts and crafts programs, but art is not woven into the very fabric of the program itself.

We believe that environmental education must address and involve the whole human being, not just fragmented parts. Scientific inquiry, the social science focus on the channels for resolving environmental issues, and artistic expression of feelings about the environment through painting, drawing, music, theater, and dance are all critical to a well-rounded environmental education program.

Monroe (1991) and Bardwell (1992) have demonstrated the effectiveness of the story art form in teaching environmental problem solving. We take this one step further and act out the story, draw the story, or tell it musically. Through the arts, students can create visions of a brighter future, and then plan the exciting adventure to make the dream reality. Environmentalists have traditionally tried to motivate change through fear of an environmental doomsday or guilt, both of which are debilitating (Prentice 1987, Lifton 1982). On the contrary images or visions of a brighter future can be highly motivating (Bardwell 1992 and Bristow, 1986). It is critical that education help us rediscover the artist in all of us that can create those visions. One example of the power or art is Lannis Temple's trip around the world to collect letters and drawings from children about their wishes for the world environment (Temple 1992).

2. Multi-cultural and cross-cultural emphasis

Defining the relationship with nature and other human beings is the central task of any culture. This curriculum draws upon the rich cultural roots of this region's diverse population, including stories, songs, and historical experiences. While many environmental education programs emphasize Native cultures, few recognize that African Americans had a close relationship with nature to make the treacherous voyage on the underground railroad. From Asia we have the gift of nature and contemplation, from the Islamic world the strong admonitions about conserving water. Every culture has an environmental story we can learn from. We also need to acknowledge that environmental problems fall disproportionately on the poor and people of color (Bryant and Mohai 1992).

3. Issues Orientation as well as Nature Study

This curriculum combines experience in a natural setting with issue investigation. As a result of being exposed to diverse points of view, identifying alternative solutions, and being immersed in working on issues, we hope students leave the center with a stronger sense that they can make a difference.

4. Global Connections

Lessons in this curriculum frame local problems within a global context, realizing that many problems are global in scope and require global solutions. The curriculum also emphasizes the value of sharing information with other students around the world via a computer network. Dorm rooms have been named for rivers of the world, and the culminating event is a global rivers celebration.

The Process

We began the curriculum development process by listening and reading. If the curriculum is to enhance the total educational process of young people and educators, then it needs to complement the classroom learning experience. Courses of study were collected from various schools in all of the major subject areas at the fourth through sixth grade level. These were analyzed to determine how the center's curriculum might assist teachers in meeting objectives that local school boards and the state of Ohio have required.

A teacher's advisory committee was formed to help oversee the development process. Teachers from a variety of backgrounds and school districts were asked to meet monthly to offer input and to respond to outlines and drafts as they were prepared. In addition, several one time meetings were held with other teachers early in the process to get a broad view of what teachers would like to see in a resident center curriculum.

Equally important were visits with students. Eight diverse classrooms were visited and students were asked questions such as what they know about the Cuyahoga River, what activities they like to participate in, what they think of when they hear the word environment and what food they like to eat. Some students had experienced a resident program and the national park and others had not. Their responses have helped us focus on what issues are important to young people and what thoughts and attitudes they would bring to a resident program. For example, most fourth graders equated the word environment to nature and nature study, while sixth graders began to relate to issues, such as the rain forest and acid rain. They identified those issues more often than they did local environmental issues.

The staff team, including National Park Service staff, Cuyahoga Valley Association staff and members of the Arts Educational Theatre Company met in a retreat setting with Dr. Gary Mullins of the Ohio State University to begin to establish goals and objectives for the curriculum. The staff then wrote learner outcomes and overviews for units. Teachers reviewed the work after each step. In the summer of 1993 the first draft of six units was written. It is currently in the process of being reviewed.

Once reviews come in from teachers a second draft will be written. This will be reviewed in the late fall of 1993 by teachers, administrators and a variety of resource people with expertise in multicultural education and content background. Additional units for evening programs and pre and post site units are also being written.

The units will be piloted in field trips in the late fall and early winter. Students that participate in the resident program beginning in January of 1994 will assist with piloting the resident program. Further revision will be made during 1994 based on the pilot experience and the complete curriculum should be finished by the end of 1994.

This exciting process has enabled us to begin to create a curriculum that will be relevant to schools and students. Young people can make a difference in the world and we hope that this program will be significant in helping them share their abilities.

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STRAND III : NONFORMAL PROGRAMS

Introducing GREENWORKS!

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The key to a healthy environment lies in informed action. This is the premise and goal of GREENWORKS!, an environmental education and community action partnership between two outstanding national networks, Project Learning Tree and the U.S. Junior Chamber of Commerce.

Project Learning Tree is an award-winning environmental education program used both in formal education settings and youth organizations throughout the nation, as well as internationally. PLT uses the forest as a "window on the world" to increase students' understanding of our complex environment, to stimulate critical and creative thinking, to develop the ability to make informed decisions on environmental issues, and to instill in students the confidence and commitment to take responsible action.

The U.S. Junior Chamber of Commerce, with its 4500 chapters and quarter-million members, is a leadership training organization devoted to community involvement and civic service. In communities across the country, Junior Chamber members have built thousands of parks, hospitals and libraries; created programs for youth; and encouraged citizen involvement in the community. The Junior Chamber's concern for the quality of our communities lead them to adopt the environment as one of their national programs for the decade of the 90's.

GREENWORKS! will bridge the partners' existing networks to foster local coalitions and establish community frameworks for environmental education and action. GREENWORKS! seeks both to educate communities in environmental issues and involve them in environmentally beneficial projects by creating successful local partnerships of PLT teachers and students, and Junior Chamber chapters and members.

Educating people about complex environmental issues helps them to make responsible choices regarding plant, wildlife and fish habitat, quality of life in our communities, pollution prevention, and other environmental challenges, now and in the future. Educating people about successfully organizing, staffing, funding, and implementing projects instills the confidence necessary to take future action on their informed decisions.

Together, local GREENWORKS! teams will assess community needs, identify educational and environmental goals, and design and implement projects to achieve results. Educators trained in PLT will provide guidance on environmental issues while Junior Chamber members will share their experience in organizing and implementing community service projects.

Beginning this fall, GREENWORKS! coalitions will officially launch projects ranging in scope and complexity, such as, school-yard habitat enhancement and tree plantings to reclaiming degraded vacant lots and caring for existing urban trees; students working with senior citizens to document community environmental histories and develop remediation goals; stabilizing stream banks and reforesting areas.

GREENWORKS! offers the opportunity for people of all ages to come together in a cooperative effort to enhance their surroundings and share in the rewards of an improved environment. In addition, GREENWORKS! projects will help foster improved communication and understanding among partners.

Matching students and teachers with community leaders to act upon environmental knowledge, and providing experience in the difficult tasks of environmental assessment, building consensus on environmental choices and translating goals into accomplishments, GREENWORKS! can have a positive, long lasting effect on conservation and management of our natural resources. GREENWORKS! coalitions are expected to continue to serve as models for addressing future community environmental questions and needs. Innovative, effective GREENWORKS! projects will be disseminated for replication through the on-going work of PLT and the Junior Chamber.

Windows on the Wild

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This spring, World Wildlife Fund (WWF) launched a new environmental education program for middle school students called *Windows on the Wild*. *Windows* uses biological diversity--or biodiversity--as its organizing theme and is designed to increase the environmental literacy of middle school students. Supported by a five-year, $2.5 million grant from the Eastman Kodak Company, *Windows* will help students understand many of the issues related to biodiversity loss and provide opportunities for them to get involved.

One of the goals of *Windows on the Wild* is to encourage partnerships between formal and nonformal institutions in communities across the country. WWF is working closely with many of the nation's zoos, aquariums, nature centers, science centers, museums, and other nonformal education institutions to develop and implement *Windows*. Materials will be tested and evaluated in five pilot cities: Rochester, NY; Washington, DC; Seattle, WA; Atlanta, GA; and Chicago, IL. An expert advisory board, consisting of experienced formal and nonformal educators from across the country is guiding the program. And we are creating local advisory boards in each pilot city and have already held several preliminary meetings and focus groups in communities throughout the country.

WWF is currently conducting a needs assessment that will provide additional direction for the program. This spring we surveyed more than 14,000 middle school teachers and 3500 educators at nonformal institutions. We asked them questions about biodiversity issues, teacher training, and their needs and preferences for educational materials. We also asked for their input on our draft five-year program strategy, which to date consists of the following: evaluation of current education materials that focus on biodiversity; materials development and testing in pilot cities; adapting the materials as needed and funding grants to educational institutions to develop local biodiversity education programs; and evaluating and expanding the program in each pilot city.

To kick-off *Windows*, we produced an introductory poster and activity guide for educators that focused on biodiversity. Currently we're working on a magazine-style "primer" on biodiversity written for middle school students. And as the program develops, we plan to produce a variety of materials for middle school educators, including activity modules and case studies that draw on existing materials, posters, audiovisual materials, and computer software.

Windows on the Wild is part of WWF's growing commitment to environmental education. Through our educational initiatives both here and abroad, we are encouraging people to develop the skills and commitment they will need to bring about the long-lasting solutions that will protect the environment for those who follow.

WWF has undertaken more than 2,000 projects in 116 countries. With 28 affiliates throughout Europe, Asia, Africa, and Latin America, WWF is the world's largest private conservation organization.

Caring for the Earth—The Development of an Environmental and Natural Resources Career Workshop for Girl Scouts

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Changes in attitudes, interests, knowledge, and skills were evaluated through pre- and post-test comparisons, analysis of journal writings and informal talks with participants and staff. Based on analysis of the results, the curriculum was revised and a model program was developed for future use by the sponsoring organizations.

The Need for Career Education

A growing awareness of global environmental issues and of limits to availability of natural resources has resulted in widespread concern for quality of the environment, and, in turn, quality of human life. Associated with this concern is a recognized need for skilled professionals in the fields related to natural resource management and protection of environmental quality. Societal concerns for cultural diversity, equity in the work force, and optimal use of human talent have also lead to interest in expanding the proportion of minorities and women in environmental and natural resource career fields (Fanning 1986; CEIP, 1989; Backman, 1992). As discussed in the following paragraphs, several factors continue to prevent a greater proportion of women from entering these careers.

Research studies have further shown that deficient school science programs discourage young women from staying in science. This trend is already apparent by the time students reach the middle grades. For example, the results of the National Assessment Test, the Minnesota Assessment Test, and the British Columbia Assessment Test have shown that after the fourth grade, girls are less likely to have an interest in science (Klein 1989). As their age increases, girls become less active in science classes. One reason for this decrease is because science, particularly physical science is viewed as masculine (Klein 1989). Klein recommends that schools provide more hands-on science experiences for girls, take the bias out of assessment tests, change the perception of science as masculine, and implement a K-12 plan for career education in science to make up for the lack of role models and mistaken expectations.

Deficient school science programs have, likewise, contributed to an underrepresentation of women and minorities in natural resource and other science related professions. Underrepresentation of women in these fields has been recognized by state and federal resource agencies as well as by Universities. As evident by current college enrollment trends, this need for women in resource related fields is not likely to disappear within the near future. At present, within the University of Wisconsin-Stevens Point College of Natural Resources only 20% of all students are women. The situation is even more alarming when one considers the trend during the 1980's in which female enrollment decreased from its high of 20% to a level of 14%.

The Role of Youth Organizations

Most youth organizations, including 4-H, Boy Scouts and Girl Scouts, already have some type of career educational program in place. The Girl Scouts of the U.S.A. appear to be an especially appropriate avenue for increasing career awareness related to the environment because of the size of the membership, prior efforts in career education for girls, and their commitment to environmental awareness education (Dreier, 1988; Kennedy and Dreier, 1989). One Girl Scout program that can address career concerns in a very powerful way is the Girl Scout National/International Wider Opportunities Program. Through this program girls are offered a choice of over 20 options yearly in which they explore new experiences, learn about lifestyles, acquire new skills, make new friends and recognize their fuller potential. For these reasons, the GSUSA Wider Opportunities Program represents a unique and untapped opportunity for recruiting young women to the field of natural resources.

Problem Statement

As illustrated in the introduction, there is a recognized need to increase globally an awareness of environmental issues and of avenues to promote environmental quality. There is also a growing need for professionals, especially women, in the field of natural resources and environmental management. There is presently a lack of career education programs and a demand for these programs which would increase the awareness among women of these career opportunities. One promising avenue for reaching young women is through the Wider Opportunities program of the Girl Scouts of the U.S.A.

Findings

Six evaluation instruments were administered before and after the model program. These six instruments are listed below:

1. Program Goal and Objectives
2. Career Interest Inventory
3. Attitude Towards Environmental Careers
4. Knowledge Inventory
5. Environmental Issues Inventory
6. Environmental Actions Inventory

Since participants were already highly motivated and interested in natural resources and environmental quality, there were not as many significant changes in their knowledge, attitude, actions, issues, and interests. The discussion of the results are presented below as well as participants overall evaluation of the program.

In the Program Goal and Objectives instrument, participants wanted to learn more about natural resource careers, skills to help the environment and make new friends.

In the Career Interest Inventory, participants demonstrated a high interest in classes such as biology, nature study, and chemistry. They were highly interested in areas such as Wildlife Biology, Forestry, Parks, Environmental Education, and Peace Corps. On the post-test, there was a significant decrease in several natural resources careers such as hazardous waste specialist, forestry, naturalist, recycling plant manager, and naturalist. This was due in part to exhaustion from a rigorous ten day schedule.

In the Attitude Towards Environmental Careers Inventory, participants felt that we needed more laws to protect the environment and that there is a great need for trained professionals with problem solving skills in natural resource careers. Before and after the program, participants had a positive attitude towards their own aptitude and potential for success in natural resources and environmental quality careers.

In the Knowledge Inventory, there were no significant changes in participants knowledge of natural resource and environmental quality careers.

In the Environmental Issues Inventory, there was a significant improvement in participants scores on this instrument concerning issues such as air, water, population, species diversity and solid waste.

In the Environmental Actions Inventory, participants perceived that they could make a difference by contacting a politician, avoiding the purchase of certain products, and that there was a possibility of taking a legal action (i.e. law suit) which would have an influence on the outcome of an issue. There was a significant increase in their expected participation of picking up litter, reducing energy, buying environmentally safe products, reducing water consumption, recycling, and improving habitat for wildlife. Before and after the program, participants had a strong tendency to take environmental actions to solve problems such as participating in school clubs and other activities devoted to improving the environment.

In the Summative Evaluation, there was an overwhelming response of success and approval of the program. Our success may be due in large part to our tie to University and other related natural resource professionals. Activities, facilities, and staff rated good to excellent with most items rating very good to excellent. Participants felt that their expectations were met, the program was enjoyable, well organized, provided enough time and opportunity to discuss interests and concerns. They also felt the program was superior and it should be offered again for other Girl Scouts.

Summary

In summary, there is a great need to increase globally an awareness of environmental issues and of avenues to promote environmental quality. In addition, a need for career education for women in the fields of natural resources and environmental quality has been recognized. The model program, which has been determined as highly successful based on the paper and pencil evaluations as well as informal evaluations such as talking with participants, has been designed to meet the needs of young women entering careers in natural resources and environmental quality careers.

Given the large number of youth who participate in youth organizations such as 4-H, Girl Scouts, and Boy Scouts, youth organizations have a great opportunity to address career education in natural resources and environmental quality. Although the Girl Scouts and Girls Club of America are very appropriate youth organizations, all youth organizations can provide career education for women in natural resources and environmental quality. It is hoped that other youth organizations would accept the challenge of educating women on careers in natural resources and environmental quality as we recognize our responsibility for the well-being of our youth and the environment.

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A Child's Place in the Environment

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A *Child's Place in the Environment* (ACPE) offers elementary classroom teachers a fresh approach to environmental education. Teachers striving to restructure their curriculum and implement current teaching practices will find ACPE an ideal vehicle to teach environmental education throughout the 1990's and beyond. Field testers like ACPE because "their kids love it." Curriculum specialists find ACPE a valuable resource because it features an articulated, thematic, and integrated approach to environmental education that engages elementary students in constructing in-depth conceptual understanding and carrying out responsible environmental action. Research indicates that those are the core components of an effective environmental education program (Borden, 1985; Ramsey, 1992).

Perhaps the greatest strength of ACPE is that it facilitates student learning in the principle outcomes of environmental education. The outcomes focus on students constructing conceptual understandings about the natural and built (human-altered) environments and empowering them to act responsibly as informed citizen-stewards of these two environments.

Through teacher questionnaires and advisory committees with statewide representation, a broad base of consensus was derived by the California Department of Education regarding the characteristics of an environmentally responsible student. Beyond the expected rigor of demonstrating mastery of fundamental ecological principles, research also suggested that students practice problem solving through active inquiry in local environmental, political, and social issues. Moreover, there was widespread agreement that students should engage in ecologically responsible action projects, be challenged to integrate their ecological values into their lifestyles, and cultivate their respect for living things.

Those characteristics, in combination with constructivist learning approaches described in the *Science Framework for California Schools, Kindergarten Through Grade Twelve*, helped shape the criteria used to review existing environmental education curricula. (In using the constructivist approach, the teacher assesses student's preconceptions, designs a lesson to allow deeper understanding through exploration, inquiry, or experimentation, then supports students in applying their new understanding.) Although there were some existing supplemental curricula that addressed one or more of the core components of an effective environmental education program (described above), none were found to utilize all of them, especially at the primary level. This realization sparked the development of ACPE.

It was clear that California teachers needed access to a more complete environmental education curriculum, one that was interdisciplinary and aligned with several California frameworks. Furthermore, the curriculum would need to actively engage elementary age learners in constructivist critical thinking processes and instill ecologically sound values of stewardship and respect for the environment. The result is six grade-level units conceptually correlated to several California frameworks. The six grade-level units of *A Child's Place in the Environment* are:

Unit 1 (for Grade 1): Respecting Living Things
Unit 2 (for Grade 2): Protecting Soil
Unit 3 (for Grade 3): Preserving and Restoring Healthy Ecosystems
Unit 4 (for Grade 4): Caring for Aquatic Systems
Unit 5 (for Grade 5): Conserving Natural Resources
Unit 6 (for Grade 6): Achieving a Sustainable Community

Each unit consists of approximately 20 sequential lessons that are linked by a story line, guiding students through environmental awareness, understanding, value analysis, thinking and problem-solving processes, and action projects.

Each grade-level unit is designed around four major themes:

- Valuing the environment—providing opportunities for students to develop a feeling of appreciation and respect for the environment
- Systems and interactions—enabling students to acquire an understanding of the ecological concepts as they practice thinking and problem-solving processes
- Patterns of change—challenging students to recognize the ways their environment changes
- Conservation—encouraging students to act responsibly toward the environment through school and community enhancement projects and personal action

Field tests in over 100 schools revealed that students enthusiastically participate in ACPE. Through active learning students are challenged to utilize higher level thinking processes to achieve conceptual change. Students draw and write in journals, expressing their preconceptions and sharing their insights and feelings on environmental topics. They also reflect on how their thinking has changed, both conceptually and attitudinally. The students' writings, when combined with samples of their field and laboratory observations and artistic or musical expressions, yield highly enriched portfolios that enable instructors to assess the student's performance and progress more authentically.

At times, students are invited to consider making small changes in their lifestyles, like bringing to school a "reduced-waste" lunch in order to limit their daily impact on Earth's ecosystems. Students emerge with a powerful realization that their continued environmental efforts, no matter how small, do make a difference, as evidenced in healthier communities and increased biodiversity.

This curriculum provides strategies to accommodate a variety of learning styles, incorporate cooperative learning groups, and facilitate hands-on activities in the outdoors. The units are augmented with selections of colorful, culturally sensitive literature that highlight key concepts and values.

Each unit ends with lessons that provide multiple opportunities for students to apply their new understandings to relevant situations and problems. Students are invited to participate in responsible action projects that ultimately build self-esteem and reinforce ecological concepts. They experience a sense of accomplishment and empowerment when they are allowed to develop and implement action plans and projects, which they carry out with their schoolmates and local community.

The goal of ACPE is to encourage students to become environmentally literate and active. These students would value their environment, respect all life forms, understand the basic ecological principles which support our planet, and live an ecologically responsible life-style. This goal can be achieved if teachers, administrators, parents, students, and other community members are willing to make environmental education a priority in their schools. Teachers can begin this process by replacing some of their existing curriculum with a unit from ACPE, personalizing the unit by adding their own lessons and activities, and then using all six units as a framework to develop a school-wide environmental education program.

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Outreach and Citizen Participation—The Education Connection

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Introduction

In 1987, the Wyoming Game and Fish Commission adopted a statewide "non-consumptive use of wildlife" plan for the State (Wyoming Game and Fish Department, 1986). Subsequent to that action, a program was created entitled, "Wyoming's Wildlife-Worth the Watching".

The mission of the program is to provide Wyoming citizens and visitors equal opportunity for viewing and learning about wildlife, and participating in wildlife and wildland programs. Unlike others of its kind, the program is not about nongame, it's about wildlife (Wyoming Game and Fish Department, 1992). The "Worth the Watching" program involves all 604 game and nongame species found in the state and emphasizes the role of wildlife management in environmental education. It seeks to increase an understanding of the relationship between wildlife, habitat, and people, the importance of maintaining biodiversity, and our wild, free-ranging populations of wildlife. Identifying the responsibility of humans in wildlife and wildlands conservation as well as ethical wildlife viewing behavior is an essential part of the program.

Traditionally, most of the financial and political support for the Wyoming Game and Fish Department has come from hunters and fisherman, therefore most of the Department's wildlife management programs have tended to serve their interests (Wyoming Game and Fish Department, 1992). More recently however, our Department has begun to broaden its management interests and responsibilities, moving beyond the traditional single species programs to reach the much larger segment of the populace interested in "wildlife". In reaching this new-found base of wildlife support we have acknowledged our responsibility for all species: game and nongame alike.

The Education Connection

Prior to the "Worth the Watching" program, our education effort was directed primarily toward youth and teacher classroom education. More recently the emphasis has shifted to more closely meet the needs of those seeking the "hands on" approach to learning, both in and out of the classroom. And we are coordinating and integrating our education effort with the "Worth the Watching" program to enhance our existing and future education efforts.

There are four broad elements essential to our education program. The following are examples of each element:

1. Training. Annually, the Department offers a three day teacher conservation camp, designed to increase the knowledge of the participants regarding wildlife and habitat management. The teaching staff is comprised of Department personnel who provide experience based learning opportunities for indoor and outdoor classroom application. Two members of the education staff are active facilitators with the Intermountain Environmental Education Training Team, which conducts environmental education workshops for teachers and resource specialists in four western states. An ongoing effort which has been an integral part of our education program is Project WILD. Project WILD is an interdisciplinary, supplementary environmental and conservation education program emphasizing wildlife. To date, over 50% of Wyoming's teacher population has been certified in Project WILD.

2. Teaching Assistance. Through a partnership with the University of Wyoming's Institute for the Development of Teaching, several environmental/conservation education programs have been implemented. "Teacher as a Researcher" is a program designed to provide opportunities for elementary, middle, and high school teachers, to become familiar with science research. Through this program a student activity guide (grades K-12) was developed for the Department's Sheridan visitor center. The activity guide is designed for use by teachers and youth leaders to help their students better understand the concept that wildlife and people share the land. Other programs involving the Department and the University of Wyoming include: 1) the Water, Youth and Optimism program, a water curriculum for students K-6 grade; 2) the Statewide Integrated Conservation Education Program which has undertaken the task of compiling and writing activity books designed to integrate the important concepts of the inter-relatedness of man and the environment; and 3) the Conservation Connections Natural Science Workshops which offer opportunities to teachers to gain hands on experience in the knowledge and teaching of Natural Science. The department participates in these programs by providing facilitators to assist in workshop training and by providing scholarships to teachers. Department personnel periodically assist schools by designing and teaching elementary school electives such as hunter education and other wildlife related topics. Other examples include combining outdoor recreation skills, such as canoeing, with environmental education learning experiences such as water investigations. The agency also provides teaching aids in the form of publications, instructional movies and videos, species specific wildlife profiles, and educational study kits on grizzly bear and black-footed ferrets. We have also developed a series of habitat extension bulletins, which serve as reference documents for those seeking technical advice on the maintenance and enhancement of wildlife habitat. We have also entered into an agreement with the Center for Wildlife Information to produce a wildlife stewardship viewing guide and slide tape program specific to Wyoming.

3. Advising and Financial Assistance. With many school districts experiencing inadequate budgets, this element has been the heart of the education connection for many teachers. The department has been directly involved in planning and funding (in part or total) a variety of environmental education related projects such as life science laboratories, outdoor classrooms, nature trails, and backyard habitat developments. We expanded our Project WILD program by making grant monies available for Project WILD Certified educators who plan to conduct classroom activities and/or projects which encourage involvement with youth in wildlife and wildlife habitat studies. In addition we have entered into partnerships with local school districts to provide display materials for student investigation and study.

The Department is currently involved in cooperative interpretive education projects on every national forest in Wyoming, six state parks, four state travel information facilities, two inter-agency visitor centers, 14 communities, eight school districts and two private land parcels (Kruckenberg, 1983). In addition, seven completed or nearly complete wildlife viewing sites around the state have been developed. Each site is within close proximity of a town, are constructed so as to be accessible to all wildlife enthusiasts, and provide interpretive education.

4. Citizen Involvement. Wildlife enthusiasts in general, welcome the opportunity to directly participate in wildlife management and planning activities. Volunteer programs are an effective way of providing avenues for citizen participation. An advisory team of Wyoming teachers and school administrators are currently in the process of developing an Outdoor Recreation Education Opportunities program. The goal of the program is to develop in youth, primarily grades 7-9, the skills necessary to participate ethically and successfully in those outdoor recreation activities that relate to wildlife and conservation. The Volunteer Information Center and the Retired Seniors Volunteer Program, both of Laramie, Co., WY., have entered into an agreement with the Department that will enable volunteers to assist with projects and do something positive for wildlife. Volunteer teachers through the "Worth the Watching" program developed student activity guides for our Ranch A, Sybille, and Cheyenne visitor centers. A group of over 200 Wyoming youths volunteered and assisted our waterfowl biologists in goose banding projects this year. Other youth oriented programs such as Eagle Scout projects and high school science clubs provide opportunities for citizens to actively participate in wildlife management programs, thereby developing an appreciation for wildlife and their habitat. The National Bighorn Sheep Interpretive Association was organized to provide a support base for the National Bighorn Sheep Interpretive Center. The association currently has over 200 members, 29 of which operate the facility this past summer.

Summary

"Wyoming looks to its wildlife resources, not just as a unique and treasured hallmark of our natural heritage, but as a potential economic lifeline" (Petera, 1990). In so doing, the demands for wildlife-related recreation will increase and diversify while at the same time wildlife habitat will continue to be lost to conflicting uses of land and water. Realizing that a well informed, more involved public results in a more supportive, diverse, and committed constituency, the Wyoming Game and Fish Department will continue to develop ways to enhance public enjoyment, understanding, and appreciation for wild animals in their natural habitats. Wyoming's Wildlife "Worth the Watching" program is one of the most visible and successful programs of its kind in the nation. As its popularity increases, so will the opportunities to enter into new partnerships for environmental education and citizen participation to meet the demands of a changing society.

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Stories to Partnership

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Whom do we wish to partner with: People? Animals? Plants? The Earth? Living our life focused on differences makes others strangers and us feel alone. However, journeying with others and sharing our life experiences nourishes us with the wisdom of each other. The American Indian tradition knew that all the animal peoples have a story to share. Stories are not meant to tell facts. Rather, to express ideas, share an experience of wisdom, for fun or entertainment, to entice us to think and remind us of our connections. Today I will tell you a circle of stories of earth, plants, and animals.

We may look at ourselves as superior to plants and animals. However, there is a price. Arrogance could be a word to describe the resulting behavior. So could blindness and isolation from all that we are dependent upon. In many ways we have not begun to comprehend the price, the consequences, the loneliness. Chief Seattle says: "If all the beast were gone the people would die of loneliness." But what if just some were gone? What about the plants? If all were gone we'd also die of starvation. If all the plants were gone, beef would quickly get quite boring. Our spirits would wander searching for the beauty of the flowers. Has anyone noticed a flower today? But what if they were gone? Why even the rocks would weep—for there would be no one to drink the dew the rocks had collected during the night. There would be no one to tell a story to. Would you like to hear a story?

Story of the Stone—Seneca

The stones are ancient. They remember the stories of the beginnings. It is more important than ever to tell our children stories. Today in the TV world of "entertain me," we need to offer children opportunities to stretch their imagination to formulate the pictures and scenes in their mind. Not everyone feels comfortable telling stories. However, as teachers you can all read. Read stories to the children. One of the things I treasure best in fifth grade was that my teacher read to us fifteen minutes a day. How you read is the secret. Use your imagination and feelings as you read it. Sometimes stories are told to play with the mysteries of the earth or express its sacredness. Every time I hear these stories, I see and hear it in a new way.

Origin of the Snake and Yellowstone Rivers: Shoshoni and Bannock

We are part of the earth, a strand in the web of the earth. Our actions affect the whole, and we do not control the whole. In the olden days in Europe as well as the U.S., the people recognized the earth as sacred. They recognized all creation held the signature of the Creator. And so everything holds a revelation or story of the Creator. In our day many people who talk of our relation with nature, speak of the resources. According to Webster, resources means "a natural source of wealth or revenue." Can we see this wealth in terms of GIFT TO BE TAKEN CARE OF AND TREASURED? Or do we see it in dollar bills? Can we recognize that all life has a right to life just because it is, or just because the creator made it? Or does it have to have a human use purpose for a space on this earth? If flowers are not edible, do they have a purpose to be?

Tommie Dapple Retells a Tale of Texas: The Legend of the Bluebonnet

Chief Seattle say, "Whatever befalls the earth befalls the sons of the earth. Man did not weave the web of life; he is merely a strand in it. Whatever he does to the web, he does to himself." We are all connected. So how did the Lokota Sioux come to celebrate our communion with all creation?

The Sacred Pipe

Finally, an important reason for stories are for fun even while they tell us about life and our living. The coyote is a very ancient animal, an ancestor to the dog. The dog is a close friend to us. In fact many people speak of their pet as part of the family and very smart. Yes, so are many of the other animals. Many people know how smart the coyote is. That is a reason why they are both hated and liked. The more I learn about the coyote, the more I learn about myself.

Coyote and the Mice: Southwest Stories of Coyote

I hope you have been enticed to think, laugh, be open to a wisdom of life and reminded of another story. For as Grandfather Stone says: As long as you tell stories, there will be more stories to tell. And then school won't seem so long and the cold will seem to melt away.

Environmental Education Internships

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Lake County Forest Preserves

The Lake County Forest Preserve [LCFP] is a tax supported agency dedicated to preserving and restoring the natural communities of Lake County, while providing educational and recreational opportunities on the land. The Environmental Education Department provides comprehensive programs increasing public awareness and knowledge about northeastern Illinois natural history, and encouraging appreciation and support of the agency's mission. Internships, established in 1985, support that effort.

Internship Foundations

Environmental Education Internships benefit both the intern and the agency. College students and recent graduates seek environmental education internships for field experience to aid in making make decisions about careers and graduate schools. Applicants value gaining experience so highly that quality interns can be found for positions offering little in monetary rewards. Environmental education internships can provide additional staff during peak program periods, and project development previously delayed due to staff time constraints.

Successful internships require sufficient agency support, comprehensive planning, and effective matching of agency needs with intern skills. Before initiating an intern program, consider if enough staff time can be freed to oversee the recruitment, training, and evaluation of interns, and if housing, board, or a stipend can be furnished. Write a job description, and a training and evaluation schedule to facilitate estimating staff time requirements for program support.

Develop job descriptions by listing intern activities that meet agency goals. The LCFP environmental education intern job description includes learning and presenting the slate of youth program offerings, developing and presenting a number of general public programs, answering the public's questions about natural history topics, participating in major public events, and completing a major project.

A clear training outline organized before recruitment establishes the kinds of skills sought in applicants, assuring a good fit between agency requirements and intern abilities. LCFP environmental education internship terms begin coincident to seasonal class training. Orientation covers the psychological development of children, and trail side teaching techniques. Interns read books and articles about interpretive techniques, and the philosophy of interpretation and environmental education. Two to three hour training sessions covering each developed program, followed by a chance to observe these classes being taught provides sufficient background for interns to begin teaching. Review of program development techniques enables the interns to begin designing programs.

Laying this foundation enables provision of complete information to applicants, potential sponsors, college placement offices, and college departments which might confer academic credit for the internship. Initial planning enhances the intern's experience by providing clear cut expectations, performance checkpoints throughout the term, and expeditious training enabling interns to teach as soon as possible.

Recruitment

Recruitment occurs primarily through placing advertisements in environmental job newsletters. Early advertising allows time for submission of applications, evaluation and hiring well in advance of the beginning of the internship. Typically the LCFP runs advertisements for two months, starting six months in advance of the beginning of the internship.

Sending information to college and university placement offices provides another recruitment vehicle. Focus recruitment efforts on schools with decided strengths in fields of interest. College guidebooks give listings broken down by major that can be used to develop a basic recruitment list.

A written overview about the internship serves as useful recruiting tool. The overview states agency goals for the internship, outlines the experience, including the main duties, training, major events, any expectations that the interns' work schedule will vary from the standard work week, and length of term. Include recruitment information, such as minimum requirements to be met by applicants, an outline of application procedures, deadlines, and what supporting paperwork should accompany the application. Comment on the agency's willingness to work with a university in conferring credit, specifying when and how the interns will be evaluated.

Colleges on the recruitment list receive a cover letter, the overview statement, an application form, a list of the youth programs taught by the Environmental Education Department, a flier about the LCFP, and a poster outlining the position benefits and requirements. Once the placement offices learn of the openings with your organization, most will request annual updates.

Selection

Selecting interns requires matching agency needs with applicant goals, abilities and potential for benefiting from the experience. When selecting the few candidates to interview, first, consider only candidates who submit a complete applications on time. The LCFP requires a resume, a photocopy of transcripts and a cover letter explaining the applicant's goals professionally and for the internship, or a completed application form accompanied by a photocopy of transcripts. Second eliminate those who don't meet minimum requirements. For the LCFP that means completion of two years of college level course work in biology, education or related field. Base final selection on demonstrated interest in the field, revealed through volunteer work or college clubs. Consider the applicant's experience level. Candidates with extensive experience in similar internships or jobs would not benefit as fully from the internship as those who are just entering the field. The LCFP Environmental Education Internships are dedicated to training new professionals, not just gleaning extra help during heavy program periods.

Candidates are interviewed by telephone, eliminating prohibitive travel expenses. In the interview the internship is outlined for the candidate. Questions about public speaking experience, contact they've had with children, and perceived challenges in handling particular age groups, concentrate on the candidate's leadership ability. Queries about their goals for the internship and past work experiences highlight their work ethic and motivation. Questions about handling unpleasant people in a professional capacity reveal their tactfulness and ability to think on their feet, important qualities for public service jobs. Ideal candidates are articulate, goal oriented, have a sense of humor, and charisma, or the ability to engender enthusiasm in an audience. After the interviews, reference checks focus on the candidate's reliability, follow through, ability to work well in groups, and benefit from constructive criticism. Only after candidates have accepted positions are the other applicants rejected.

Evaluation

Maximizing intern skill development depends on providing feedback. Evaluations occur in a number of different ways. Shortly after arrival, interns establish five or six goals to achieve in the course of their term. The goals the intern set are used, in part, to evaluate their progress through the internship, but also to guide the intern to educational opportunities related to their goals.

Evaluation of intern program delivery and development occurs through a number of means. Field trip leaders who use our services return evaluation forms focusing on program leadership and content. The intern gets these forms. Receipt of a particularly negative evaluation prompts a meeting with the intern supervisor to review what gave rise to the poor evaluation, and what means could be used to address similar problems in the future.

Within the first two weeks of teaching, the intern tapes one of their classes, and submits a written evaluation of their performance. Then the intern supervisor observes and coaches an intern program. Directly after the class observation the supervisor provides feedback to the intern about techniques that would make the intern more effective.

The interns develop and deliver a series of weekly classes for first through fourth graders. They submit lesson plans developed in advance of the classes for review. A coaching session scheduled for an early session of this series allows steering the intern in more productive directions if necessary. Coaching focuses on the intern establishing rapport with the students, presenting topics and materials that are age appropriate, and having fun with nature, as opposed to being too pedagogic. Coaching also occurs during one of the intern's family programs. Other coaching sessions are scheduled as needed or requested by the intern.

Half way through the internship, the intern receives a formal written evaluation of performance. The evaluation covers twelve points, and offers constructive suggestions for improvement in any problem areas. The points covered in the mid-term evaluation include personal habits, responsibility, attitude, judgment, attendance and punctuality, oral and written communication, quality of work, knowledge and understanding, independent functioning, productivity, and programming.

The final evaluation focuses on improvements made in any weak areas covered at the mid term evaluation, and progress made toward the interns' personal goals. The intern evaluates the internship, to provide guidance on any program weaknesses that may be remedied.

Conclusion

Internships increase staff during peak program periods without major increases in budgets. However, interns require good supervision and training for a successful experience, for both the intern and the agency. Before beginning internships, carefully consider who will supervise them, and how time will be cleared from that person's schedule to accommodate the needs of the intern for feedback guidance, and evaluation. If done correctly, an internship can provide increased services to the public and a solid positive experience for future professionals in the field.

Feather Care Program

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This study is part of a Master's thesis which I have been doing at University of Victoria, Canada. I choose this case study to consider this experimental project a reflex of community organization gathering taking care of the environment.

Case study profile

It is a nonformal environmental education program

It takes place in a rural area involving a community of farmers

It is concerned about monitoring native birds in Alberta Province

The original study is concerned about its structure as a community-based organization and the value system which the farmers have when they enter into this program as volunteers.

Community-based organization has been chosen by communities as a successful method of community work focused in horizontal structure or individual responsibility.

The set of values with this population in the program will lead them to act on the environment. Some professionals, as foresters, administrators, educators, as well as organizations, predict that if we as a society change the current values we would be able to change the actual route which we are on now. Having that in mind I intend to use the Value Paradigm developed by Christopher Hodgkinson, recently retired Professor at the University of Victoria, British Columbia. In his book, Educational Leadership—The Moral Art, he organizes categories of value types hierarchically beside the distinction between motives, values and attitudes.

Environmental Volunteers SHARE in Nature Program

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Introduction

SHARE In Nature offers a community- and volunteer-based program, organized and directed by a science education professional and implemented by trained volunteers. It brings supplementary hands-on environmental science education to local schools, thereby insuring that this valuable learning context will be available to participating teachers and their elementary school children. Interactive environmental science education has been proven to be one of the best ways to impart basic science concepts to elementary school students. However, this teaching method can be problematic for teachers who: a) lack adequate time to prepare the specialized materials; b) lack adequate in-school resources; or c) are not confident of their science skills.

The Environmental Volunteers

The twenty-two year old Environmental Volunteers (EVs) is a nonprofit 501(C)3 education organization dedicated to promoting understanding of, and responsibility for, the environment through hands-on environmental science education. The organization was initiated in 1972 by a small group of local educators who developed and taught a baylands ecology program to elementary school children in Palo Alto, California. Since then, the organization has grown steadily from 32 to over 180 volunteer docents teaching seven different programs in most school districts in Santa Clara and San Mateo counties.

Program Objectives

Objectives of the Environmental Volunteers program are:

1. Provide elementary children with an understanding of the interrelationships within nature.
2. Provide children with tools for understanding their responsibility in maintaining a healthy environment.
3. Improve elementary teacher's natural science knowledge through professional workshops.
4. Provide guidance for implementing a hands-on science curriculum.
5. Provide methods for integrating natural science concepts with other school disciplines.
6. Involve community volunteers in the education process through direct experience with students.
7. Train volunteers in hands-on science teaching methods.
8. Provide schools with interactive materials that are created by volunteers and kept at the school.
9. Provide a sustainable program that can be disseminated and implemented by any school anywhere.

The SHARE Model

The SHARE model includes three basic components.

1. Training elementary teachers to incorporate SHARE into their curricula through professional development workshops.
2. Development of a school-based corps of community volunteers who are trained in teaching methods and natural science topics.
3. Production of creative, inexpensive, hands-on teaching materials developed for classroom use with elementary children.

At the beginning of each school year, participating teachers select from one of the following programs: Forest/Foothill, Baylands, Marine & Suburban/Urban Ecology, Earthquake Geology & Preparedness, Water Science & Conservation, or Early California Indian Life: An Environmental Focus.

The environmental core of the program--teaching different age levels and how to use the hands-on materials--are taught to volunteers, who are recruited by the participating school's parents, teachers, administrator and business leaders. After 49 hours of training the volunteers are ready to visit classrooms and present the interactive program to children, grade levels K-6. When a volunteer visits a class he or she makes use of a variety of learning materials including natural artifacts, models, puppets, and games and activities. Often several visits to a class are concluded with a field trip.

The selection of schools invited to participate in the pilot phase of SHARE was based on geographic location, willingness of school administrators and teachers to be involved in the program for a three year period, and ethnic and economic composition. In 1991 two schools were selected, followed by three additional schools in 1992. Teachers are actively involved in all phases of program planning, and implementation is based on a collaborative effort of a science-skilled program director, SHARE volunteers and teachers.

SHARE is tailored to each participating school's needs and, therefore, becomes an integral part of each school's curricula. Teachers can elect to receive a minimum of 12 hours of workshop and field trip training every school term to enhance their knowledge in the designated program.

SHARE in Nature is intended to keep participating schools and communities involved over an extended period of time. Workshop sessions for teachers and community volunteers are presented by EV specialists and resource people who live in the community. The EV Program Director is responsible for all training sessions as well as overseeing coordination of the entire program at each school site. Each successive year, participating teachers and volunteers receive ongoing training and enrichment courses and other selected programs. Over time, participants can be fully trained in all seven EVs programs.

The SHARE in Nature program begins its third year in the Fall of 1993. To date, the five schools have a total of 60 participating teachers and 36 volunteers. Included among the volunteers, are 24 local high school students from four high schools.

School-Site Management

Each participating elementary school has a volunteer School Site Coordinator who is responsible for the volunteer activities at that school. The School Site Coordinator maintains active communication with the Program Director, teachers, principal and other volunteers, as well as being responsible for scheduling volunteers for classroom visits and field trips. Even though volunteers are only required to visit their school twice a month, assessment records indicate that volunteers visit their school an average of once a week.

Each school initially receives 12 learning kits, put together by volunteers; the kits become the permanent property of the participating school. Volunteers at the original two schools have increased this number to 24 kits. The kits are designed to be used with specific grade levels and, after how-to-do instruction, are constructed at home, on weekends or whenever a volunteer has free time. Often parents and children become involved in kit making, thereby expanding children's and parents' science knowledge, as well as providing an opportunity for positive interaction.

Program Evaluation

Current evaluation tools consist of pre and post science literacy tests, record logs of volunteer time and written comments from teachers, principals and volunteers. Measurement of teachers' science literacy shows an increase of 40%, while volunteers' science literacy increased 50%. Teachers missed an average of 6 pre-test and 2 post-test questions while volunteers missed 7 pre-test and 2 post-test questions. These statistics have remained constant for the three new schools that joined the program in 1992. Evaluations and first-hand experience indicate that the high school volunteers require more supervision, teaching techniques and encouragement than was previously anticipated. This is due, in part, to the fact that many of the high school students participating as volunteers were chosen because they are at risk of dropping out of school. It was felt that working as tutors to the younger children would help build self-esteem. This has proven true, and, in fact, a number who were in a modified shortened hours program have elected to return to the standard high school curricula and get their diplomas. The EVs are currently developing an assessment tool to gauge the effect of this program on the elementary students. Assessment tools will be further refined dependent on the outcomes of the three-year pilot program.

Funding and Program Expansion

Funding for the SHARE program has been through grants from community foundations and the California State Environmental License Plate Fund. To date the program has received some $75,000.00 in contributions.

The EVs plan to eventually expand the program throughout the San Francisco Bay area and greater California. Facilitation of this process will be through the development of training manuals, fees and long-term contributions from the business community all geared to help make the program self-sustaining. The SHARE program model--training volunteers to become science resource assistants at a particular school for a minimum of one school term, and having volunteers prepare the learning materials--is easily applied to any community. It is entirely feasible that, once a how-to-do-type manual is designed, other environmental education organizations would want to adopt this model for themselves.

Conclusion

SHARE In Nature is a viable and exciting program that answers a need to intensify elementary students' natural science experience. It provides an important foundation in environmental science that will further students' abilities in future science training and promote responsible action on behalf of the environment.

If you are interested in further details about the Environmental Volunteers and the SHARE In Nature program and wish to develop this model in your community, contact Program Director Karen Meisenheimer.

The Ultimate Journey

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Millions of children live in a world of concrete, broken glass, abandoned buildings and cars. Where wildlife consists of the rats, pigeons and roaches that infest their lives. This is a world where schools fail to educate children and the future is often measured in days or weeks. These are the children and communities sought out by Boys & Girls Clubs of America.

These are also the children that most environmental education programs miss. There are several reasons for this. Children living in the midst of poverty, smog, noise and urban blight often feel the environment is someone else's problem, if they give it any thought at all. There is nothing they can do about it. Why would these children care about global warming? They go to bed cold at night. Why would they care about the loss of the rainforest? They don't even have trees in their neighborhood. How can they be expected to care about something they have never seen and know nothing about?

The Ultimate Journey brings the natural world to children who have never been exposed to anything outside of their neighborhoods. **The Ultimate Journey** begins by capturing a child's imagination. This sounds like an adventure. The program is promoted with "travel posters." Lead-up and promotional activities are fun and give children a taste of something new and exciting. They "apply for their passports," attend a "briefing" and are "issued tickets" allowing them to "embark" on **The Ultimate Journey**.

The Ultimate Journey is a ten-week, small group program that introduces children, six to twelve years old, to the wonders of the natural world. Through carefully selected activities, children are first exposed to wonderful facts in a way that has meaning to them. For example: the group leader may conduct a contest to see who can jump rope 90 times the quickest. All participants take their turn, typically taking one or two minutes to complete this challenge and get very tired in the process. While everyone is resting, the leader talks about birds. "Did you ever notice how fast birds flap their wings? I wonder if any of us can skip rope as fast as a bird flaps its wings?" While the children are resting, they will talk about this for a few moments, thinking of sparrows, pigeons or seagulls-whatever they are used to seeing. The question may be posed, "What bird do you think flaps its wings the fastest and how fast do you think it flaps?" After some random guesses, the leader can give them the answer-the hummingbird can beat its wings 90 times a second! A prepared leader can show a picture of a hummingbird and share that it is also the smallest bird in the world. The participants have just completed jumping rope 90 times so they can relate to this number and the time in a very personal way. They are awed and will remember this fact for a very long time. They are excited, even though they probably have never seen a hummingbird! They will want to know more about this mysterious creature. Imagine their delight when they learn this tiny bird can hover in place like a helicopter and actually fly backwards as well! Similar activities highlight the size of the blue whale, the speed of the cheetah and size of the sequoia tree, none of which are likely to have been a part of their lives. However, because of the presentation, children not only become excited about their new found knowledge, they also retain this information.

At the end of each meeting, the children make entries in their passports. Each meeting represents a stop on their journey. They conclude each meeting by reciting **The Ultimate Journey Creed**. This reminds each child that there is much they can do for the environment. That they have a responsibility for the welfare of the planet and that the things they say and do are very important.

Week by week, the natural world becomes more important because they participate in activities that help bring new concepts to life. Children are learning exciting things, (a unique experience for those who hate school) and they are learning to notice things around them. They also learn about some of the problems facing the environment. They plan and conduct a project to "protect, preserve, enhance or restore" the environment. This is very important because it demonstrates the importance of personal behavior and its impact on the environment. This is a very powerful concept for children who may have been conditioned to feel that they cannot influence the world around them.

Some of these projects have been very substantial. A group of children in Utah learned everything they could about the desert tortoise. They raised money to launch a public education program and worked with the DNR to protect the tortoises and their habitat. They were recognized as state winners in the Take Pride in America. In other projects children have worked to protect coral reefs, restore campsites in natural areas, planted trees, launched recycling projects, or began composting. Every project helps children learn that they can make a difference.

Finally, the group takes a trip to a state park, the mountains, the shore, or other natural area. An environmental professional such as a forester, naturalist or conservation officer meets with the group and acts as their guide. The participants experience a world they have heard about, but in all likelihood, never seen. Surrounded by nature, a presentation ceremony takes place. Each child recites the creed and is presented with a certificate recognizing the successful completion of the journey. They also receive an embroidered patch, a symbol and constant reminder that we must all act responsibly to protect the planet. The completed passport serves as a reminder that there is still much to be done and everyone must continue their efforts to understand and preserve our planet and our environment. This is a very meaningful experience for these children, and very often for the leader as well.

The Ultimate Journey accomplishes many things that are unique:

- Others are never blamed for the problems facing our environment;
- Each participant is empowered to make responsible decisions and to take personal steps to help protect, preserve and restore the environment;
- Leaders and children explore and learn together. **The Ultimate Journey** clearly presents activities along with resources for additional information to help leaders prepare for each activity.

After a year and a half, **The Ultimate Journey** is being conducted in 47 states, Europe and Southeast Asia! Through this program 20,000 children have learned about the environment and have taken steps to protect it. This program works in any community, anywhere it is introduced. All that is required is an interested adult leader and a copy of the curriculum. Typically, group leaders are products of the same background as the children with which they are working. This is one reason they are able to work so successfully with children in these communities. Everything they need to know is clearly presented in the curriculum describing each activity.

Boys & Girls Clubs of America is uniquely equipped to reach children living in the inner cities of America. For over 130 years, we have sought to provide services to children that others either could not or would not serve. Today there are over 1460 facilities providing services to over 1.9 million young people all over America. Full time professional leadership, supplemented by part-time and volunteer leaders know how to reach these children and help them overcome the obstacles they face and make better lives for themselves. Today, many leaders in business, government, entertainment and sports look back at their years in a Boys & Girls Club and know that their lives could have turned out very differently had they not been exposed to the professional leadership, programs and environment provided by the Boys & Girls Club.

The Ultimate Journey is another example of the ability of creative, skillful and dedicated professionals to identify an area where children are not being served and to create a program to address the needs of children as they relate to this area.

Integrating Environmental Education at Historic Sites

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> Canada's national historic sites commemorate and protect nationally significant aspects of human interaction with the environment spanning thousands of years of human life... They provide unparalleled educational opportunities for Canadians to experience first-hand the nature of this relationship and how it has helped to shape this country's modern destiny. Canada's Green Plan, p. 89

Background

In response to the Brundtland Commission Report (1987), Environment Canada[1] produced the Green Plan (1990). It too recognizes that environment and social issues are interrelated. It also acknowledges the role of the Canadian Parks Service interpreters in actively delivering "environmental citizenship"[2] messages.

Initially, Green Plan implementation and Environmental Citizenship were introduced as top-down policy directives. Field staff at national and historic sites were told to provide environmental messages in all their interpretive communications. While some viewed these initiatives positively, others had difficulty. Some historic interpreters who saw "green messages" as unrelated add-ons while others expressed concerns that they did not have the necessary skills and knowledge readily available because their expertise lay in other areas.

This top-down approach is not unusual for an organization implementing a new policy directive, but it runs counter to the our current understanding of the ways of the creating positive environmental actions in individuals (see Hungerford & Volk (1990)[3].

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[1] A federal government department. At the time of this workshop the Canadian Parks Service was part of Environment Canada. Changes in government have resulted in the transfer of Parks Canada to the new Department of Canadian Heritage (still pending approval).

[2] Term used by Environment Canada.

[3] Hungerford, H. R. and T. L. Volk. 1990. Changing learner behavior through environmental education. Journal of Environmental Education 20( ):8-21.

Staff at the Atlantic Regional Office recognized the weaknesses of the initial approaches and sought to correct it. This workshop followed an earlier workshop for national parks staff and two annual historic site workshops which had touched on the Green Plan in 1991 and 1992.

Participants and Theory

Twenty-one people took part in the workshop representing national headquarters, regional office, national parks and the historic sites in New Brunswick, Nova Scotia, Prince Edward Island and Newfoundland.

While the regional office had seven major goals for this workshop, essentially, it focused on providing participants with:

- a sense of **ownership** of the issue(s)
- knowledge and ability to use the skills needed to act, and
- **empowerment**

These are basic factors outlined by Hungerford & Volk (1990) needed to create change in learner behavior through environmental education. Similar basic concepts are presented in other methodologies which focus on educating to create behavioral changes (for example, Paulo Friere's work in popular education). In general terms, to create change, people need to:

- be able to identify the problem and the possible solutions
- feel that they have the skills to apply the solutions or to implement change
- as individuals, feel that s/he will be successful or will receive positive support for acting

The process of this 3-day workshop, (see Table 1, **Edited Agenda**) was developed to meet these needs and to help individuals to recognize their own abilities as environmental educators. The process was also developed to help identify areas which needed further development or which needed support.

There were three areas which we were looking at when discussing environmental concerns at historic sites:

1) **"corporate greening"**-changing of institutional practices to more environmentally sound practices (eg. recycling, composting, type of products purchased, energy reduction, vehicle use, stop pesticide /herbicide use)

2) **information/education**-This refers to the very basic level of providing a "green message" (eg. "It's good to recycle) to the integration of environment and culture to create understanding and positive environmental action.

3) **site/artifact conservation**-It was recognized that many sites were threatened by increasing environmental pressures for example, buildings and artifacts damaged by acid rain. Questions such as "Where do we obtain the replacement timber to restore sites and what impact will this have?"

DAY 1
Set ground rules and workshop objectives
Reports from each site about their environmental citizenship activities to date.
Group discussion of culture and environment relationship.
WORKSHOP 1
Define the mandate and main objectives of the Regional Environmental Communications Program as it relates to **cultural heritage**.
Working group reports
Discussion to establish consensus regarding mandate and 3 main objectives.
DAY 2
Generate a list of factors to consider when developing programs.
WORKSHOP 2
The Fortress of Louisbourg used as a case study to look at how we would achieve one or more of the 3 priority objectives described at the conclusion of Workshop 1.
Group reports and discussion. General discussion of group recommendations.
DAY 3
Round table presentation by participants of preliminary ideas for environmental programming at their own site.
Closing discussion-historic site representation on regional steering committee; priorities and regional action plan for 1993/1994.

Table 1: Edited Agenda

Workshop Process and Results

After establishing the ground rules for the workshop and outlining the group's objectives for the workshop, each participant was asked to report on their site's current environmental citizenship activities. Most reports dealt with corporate greening and information/education activities.

Site reports indicated significant changes in their operations but participants recognized that there were many changes still to be made. An interesting highlight of this activity was the discovery that practices could be changed and that other participants could help. For example, one person reported that organic controls could not be used in grounds keeping at his/her site. Other participants said that their sites had changed to more environmentally positive grounds keeping practices. These examples, and the knowledge and the resources these people were able to provide, allow this person to re-approach the issues with a greater potential for success.

The information and education activities generally reflected an add-on approach as opposed to the more integrated approach that the Parks Service is working to develop. Activities included such things as environmental messages in brochures or posted at the site or displays and projects as part of "Environment Week". There were several notable exceptions such as tree-planting, involvement in the development of an eco-museum and similar projects.

After these reports, the participants were divided into three groups to discuss the mandate and objectives of a Regional Environmental Communications Program as it relates to historic sites. After group discussions and presentations, the group looked for similarities and created the following draft objectives:

- Lead by example to affect people's values and behavior
- Encourage public understanding and support for preserving Canada's heritage
- Use historical perspective to help understand today's environment in order to affect human values and behavior

The Fortress of Louisbourg Example

The group had been given the choice of using their own site or using the Fortress of Louisbourg. They chose the Fortress to provide a common basis for discussion.

On Day 2, before beginning the practical exercise, the group identified the factors that needed to be considered when developing programs. These included: resources, audience, message, venue, objectives, commitment, partners, knowledge, evaluation mechanisms, media, constraints and management issues.

As a result of this case study, the groups returned with interesting and innovative ideas which could be applied to integrating environmental messages at the Fortress of Louisbourg. One of the more intriguing ideas was the creation of a special program looking at the effects of being dependent on a single resource-based industry, cod-fishing, in 1740 and 1990. This project was seen as a co-operative event with the local community which has been seriously affected by the moratorium on cod-fishing. The program would take place at both the Fortress and in the community. Costumed interpreters would expose people to the life of the fishermen and their families in 1740 while the local fisherman would provide the modern perspective. The program would finish with an evening dinner with costumed interpreters and local hosts and music and food from both decades.

While this activity generated approaches for the Fortress, its main objective was to provide participants with a practical exercise which would help them in implementing changes at their own sites. This exercise was also seen one way of reinforcing their confidence in their own skills as effective change agents.

Closing session and Follow-up

On the final morning participants were asked to outline ideas and possible actions that they would try to make in both the short- and long-term as a result of this workshop. The participants had no difficulty in articulating these ideas. The consultant then contacted the participants in June to ask that they assign deadlines for the goals they had set and that they add any new goals that they had developed after the workshop. Follow-up is currently underway to further evaluate these actions and the short-term effects of this workshop (September/October 1993).

References

Hungerford, H.R. and Volk, T.L. (1990). Changing learner behavior through environmental education. Journal of Environmental Education, 20, 8-21.

Teen Recycling and Environmental Educators

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The Teen Recycling and Environmental Educators (T.R.E.E.) is a group of talented energetic youth ages 15 to 18 that have been trained about recycling, other waste issues, and environmental concerns. These peer teachers use performing arts to instruct and motivate elementary school students and the general public in two rural Minnesota counties. For more information, contact Paula Vanecek or Valerie Malmquist, Isanti County Extension, 4-H Youth Development, 221 SW 2nd Ave., Cambridge, Minnesota, 55008, 612-689-1810.

The Teen Recycling and Environmental Educators program began during the summer of 1991 as a part of the Isanti County 4-H Arts-In, a summer performing arts experience for youth. The 30-minute musical about the environment, "It's Our World", and the peer teaching program that developed was originally funded by a grant from the Minnesota Office of Waste Management with sponsorship by the East Central Solid Waste Commission. The cast of thirty-five young people performed at county fairs, the Minnesota State Fair, Minnesota Public Radio, KMSP-TV, the Recycling Building, and the 4-H Building Main Stage. The performance was also professionally video taped for use in the peer teaching program. An informational brochure was written and distributed during the performances.

The peer teaching program was modeled after the very successful "Project For Teens" alcohol decisions program developed several years earlier by Minnesota 4-H Youth Development. The advantages of the peer teaching model include the good rapport that teens have with younger children, the positive role modeling, the relief of waste education duties for the classroom teachers, and the leadership and public presentation training and practice for the teens involved.

The original training for the twenty peer teachers was conducted at an overnight "lock in" retreat. The theme was "Understanding Recycling". Technical information and waste issues training was provided by a solid waste specialist. The teens were taught teaching techniques by 4-H Extension Educators. This training include activities such as "Remember Fifth Grade" and other team activities to increase the teens' understanding of developmental characteristics of children at certain ages. The teens were also trained to use goal setting sheets and lesson plan sheets to plan their own presentations. A resource notebook was provided to each teen and a library of appropriate curricula and books was available. Working in teams of two or three, the teens practiced developing lesson plans and their peer teaching duties. A Teacher Packet and evaluations were also developed to introduce the project to prospective teachers. The teens used their own creativity to develop puppet shows and other hands-on ways to convey the message. Using the songs, dances and videos from the musical "It's Our World" has remained a cornerstone for the presentations.

Some of the teens were very active in their peer teaching role. One team taught every elementary class in grades kindergarten through eight during the following school year. Another T.R.E.E. taught sixteen sessions in one day at an outdoor field day for sixth graders. Some of the other T.R.E.E.'s gave presentations to 4-H clubs and community groups and worked with their schools on recycling projects.

The second year of the program was funded by a grant form the National 4-H Council with support from John Deere. Two more training sessions were held for the peer teachers; one focused on reuse and reduction and the second on waste reduction through consumer choices. Using the SMART (Saving Money and Reducing Trash) materials developed by the MN Office of Waste Management, the T.R.E.E.'s have provided educational displays for public events, fairs, etc. They also made public service announcements for public radio. Performances were also given for local schools at open houses and teacher workshops. At the Minnesota State Fair the T.R.E.E.'s conducted the "Learn By Doing Center" with such activities as "The Incredible Edible Landfill", dramatic story time readings of the "Lorax", and Earth Ball games. Performances were also given at the Minnesota State Fair Recycling Building. State Park visitors' education included both performances and hands-on arts activities.

The T.R.E.E.'s are now beginning to train other teens to replicate this program in other areas. The team will be traveling to Illinois in October, 1993, to train teens there. Pending funding, they are also planning a session for inner city youth in the Minneapolis/St. Paul area.

Evaluations of the performance of these teens both in the classroom and for the public have been outstanding. Their commitment and enthusiasm is contagious. The program has positively influenced the lives of the teens involved and, in some cases, has given direction to future careers. One teen has decided to pursue a career in elementary education, a field in which she had no interest until her involvement with T.R.E.E. Another student is now interested in environmental law. New teaching skills, public speaking ability, self-confidence, increased self esteem through feelings of empowerment have been additional benefits of this program.

Earth Tomorrow Program

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Designed for high school students from urban environments, NWF's EARTH TOMORROW training sessions and week-long workshop will seek to improve the integration of environmental education throughout school curriculums, stimulate creative problem solving, and encourage the use of environmental resources outside of the classroom. EARTH TOMORROW will focus on the positive aspects of the urban environment, promote an appreciation of a city's living ecosystem, provide leadership training, and actively involve students in environmental projects in their schools and communities.

A workshop attended by NWF staff members in October of 1991 brought home the need for a new generation of informed environmentalists whose lives and work are tied up in large metropolitan areas. More than 700 grass-roots leaders from cities all across America participated in the National People of Color Leadership Summit on the Environment held in Washington, DC. The message of this meeting was very clear: solving urban health problems and their environmental causes will take greater urban minority involvement in natural resource professions.

For over twenty years, NWF has operated Wildlife Camps and Conservation Summits. Sometimes referred to as "Classrooms Without Walls," these environmental and outdoor wildlife programs for individuals, families, and educators in the mountains, on the coast and in other natural and camp-like settings have educated two generations of Americans to the wonder of the natural world. But while these opportunities foster a love for the natural world, an environmental ethic, and a desire to get involved in solutions, they do not focus specifically on the problems and needs of the urban environment.

NWF is expanding its reach to foster a sensitivity to environmental issues in the daily life of the population whose backyard is the city. Environmental education, in partnership with community business leaders and leaders from all levels of government, can help urban high school students to improve the quality of their lives through informed concern and action and can open horizons of career choices for young people who want to continue their involvement on into their professional lives.

EARTH TOMORROW will help urban youths develop the confidence and skills they will need to meet the environmental challenges of tomorrow. As city dwellers, they will be called upon to find creative solutions to the many local and global environmental problems of the future. The support and encouragement students derive from their parents, instructors and teacher may lead some to colleges and careers they might not have considered without the experiences offered by EARTH TOMORROW.

Project Objectives

At NWF's EARTH TOMORROW summer residential workshop, students will discover the city's hidden natural treasures and develop an awareness of the environmental problems of the city, as well as learn how to get involved in actions needed to help solve these problems. Designed especially to reach out to those students who have had a limited opportunity for hands-on contact with environmental projects and natural resources, the workshop will give interested young adults the tools needed to make a difference in their communities through an awareness of their own skills, talents, and resources.

The program's objective is to provide high school students, beginning with tenth graders, with an opportunity to learn about the natural resources in an urban environment. Through this awareness they will develop a sense of stewardship to those resources and begin to see how they can be involved to positively affect environmental conditions. With these experiences as a base, the next step will be to communicate an understanding of how a career related to natural resource protection can be a realistic option for them.

The National Wildlife Federation is coordinating the program, using campus facilities of major urban-centered colleges and universities. Rutgers University in New Brunswick is NWF's first partner for the New Jersey EARTH TOMORROW model. The University of Michigan in Ann Arbor, may become NWF's partner in a Michigan EARTH TOMORROW model in 1994. Both universities have demonstrated a commitment to preserving natural resources, understanding environmental issues and solving environmental problems.

Prior to the Workshop

The first stage of the program is to identify and select ten teachers from five school districts in the target city. One curriculum specialist and/or school level administrator from each of these school districts will also be invited to participate. We will seek both teachers and students from culturally diverse backgrounds. Beginning in January and continuing through April, the selected teachers will participate in a series of four day-long training sessions. The teachers will return to their own classrooms and use what they have learned to infuse environmental education into all aspects of the curriculum. As teachers work with their classes, they will each identify five students to participate in the EARTH TOMORROW program.

In May, the teacher and their identified students will convene for a day with NWF and the university staff to establish a framework and goals for the EARTH TOMORROW workshop. In the time between this group meeting and the June residential workshop, each team will identify an environmental issue around which to develop a year-long project. We envision such projects as school recycling programs, environmental clubs, household toxic waste pickup programs, tree planting, creation of schoolyard wildlife habitats, energy efficiency projects, or other practical, hands-on ideas.

The Workshop-June 1994

During the week-long residential workshop, a variety of sessions will be provided to give participants the knowledge and tools needed to undertake their projects during the next year. The curriculum, covering such topics as urban environmental issues, urban ecology, leadership training and coalition building will be highlighted. The workshop will also educate participants about water quality, waste management, and environmental ethics. The program will offer possible solutions that students can pursue during their junior year. Guidance will offer possible solutions for career paths in conservation and environmental fields.

Field trips to natural areas to study ecosystems and to an urban center to highlight the positive aspects of a city will be scheduled. Visits to a variety of organizations and businesses will allow students to view environmental issues from many perspectives and areas of responsibility.

Workshop faculty will include professionals who have a talent for bringing subjects alive by drawing on local environmental features and who have experience working with urban youth and stimulating their problem-solving abilities. College professors and students, local officials, environmental education specialist, and other knowledgeable professionals will be selected from NWF, other non-profit organizations, government, business, and educational institutions.

Environmental college students, including fraternity and sorority members, will be recruited to act as mentors to the students during the workshop.

Post-Workshop Projects

At the end of the workshop, NWF will challenge each student to sign a good faith contract agreeing to perform a year of environmental community service. The students and teachers will then establish, in their school or community, the project that they've identified, coordinating the efforts of other students as well.

Teachers will maintain ongoing contact with students and provide support for their projects following the workshop experience. A newsletter, produced jointly by students, teachers, and NWF staff, will keep alumni in touch with NWF and each other.

During their senior year, students will be responsible for active environmental advocacy-involving parents, peers and other community members.

June and into the Future

We will continue to be involved with these students throughout their high school years. NWF's partnerships with the university community, business, and government will provide opportunities for internships, summer work, and scholarships to keep students involved as their interests mature. NWF wants to help urban youth develop the confidence and skills they will need to meet tomorrow's environmental challenges. With their special knowledge of urban life, EARTH TOMORROW graduates will bring a unique commitment to a lifetime of environmental protection. This program will create a pool of culturally diverse youths interested in pursuing environmental careers.

STRAND IV : INTERNATIONAL EDUCATION PROGRAMS

From Russia with Love

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Gil and Marilyn Alexander, Directors of the Canyon Ferry Limnological Institute in Helena, Montana, explain how initial contacts with Russian professors and students is resulting in a teacher and student exchange for a senior year experience and unique opportunities.

Most of us over 40 remember Nikita Kruschev pounding his shoe on the table at the United Nations and exclaiming that the Soviet Union would bury the US. Much water has run under the bridge since that time and history has been changed by a series of events which dissembled the former Soviet Union and allowed peace to break out.

Most of us still have a very fuzzy notion about Russia and still feel a bit uneasy about working hand in hand with those whom we considered our enemy for so long. Since 1990, however, many Americans have found themselves booking trips to Moscow via Aeroflot or Finnair, and in a few short hours from Kennedy airport, find themselves transfixed in a world both strange and familiar. Upon arriving in Russia, it is as though one has taken a few steps back in time.

So it was that my wife, Marilyn, and I stood in amazement at the customs line in Moscow, waiting our turn to be officially "greeted" by uniformed customs agents in July of 1991. Only a few years before, this trip would have seemed as unlikely as a trip to the moon would have been for us. But the NSTA had arranged for approximately 350 teachers to attend a joint conference between American and Soviet scientists and science teachers. For two weeks, we shared experiences, developed friendships and saw the countryside. The last night culminated in a fancy stand up dinner and dance in the halls of the Kremlin. I'm sure Stalin was turning over in his grave.

During that conference, Marilyn and I presented a paper on teaching students how to monitor the water quality of the Missouri river. Our project involves slightly more that one-hundred high schools located within ten miles of the Missouri River from its mouth near St. Louis to its headwaters near Three Forks, Montana, a distance of about 2700 miles.

As we described our project, we were delighted by the questions that arose concerning the logistics of such an enterprise. Certainly, one of the intriguing features of the network was the ability to share data via modem and computer. This is a technology generally unavailable at most schools in Russia.

Upon returning home, we continued to maintain contact with several of our new found friends and these contacts led to more introductions, including professors and administrators of Moscow State University. During the ensuing winter of 91-92 and throughout 1992 and into 1993, we began to have visitations from Russian dignitaries interested in the work we were doing with students at the Canyon Ferry Limnological Institute. We were visited by the Chairman of the Chemistry Department and the Vice Prorector (Vice-president) of Moscow State University, then by the President of a small teachers college at Uralsk, at the southern end of the Ural Mountains.

Finally, these contacts resulted in an introduction to Professor Valentin Kapkov (Valya) and his wife Helena (Leyna). Valya is a biological limnologist who has worked throughout Eastern Europe as well as Madagascar. Leyna is a Ph.D. biochemist from Moscow State University. After a couple of letters back and forth, we made a decision to invite the Kapkovs to spend the summer at our institute doing research and overseeing the work of a couple of Russian high school students. They accepted.

In early June 1993, we met the four bleary-eyed Russians at Helena's small regional airport. Even though they were tired from twenty hours of travel, they were, nonetheless, anxious to get to their new "home away from home" at the lake. Valya had recently begun taking English classes and was pleased to be able to have a conversation with us on the way back to the lake that evening. Leyna's English proficiency was a bit better. We quickly showed them their quarters and let them turn in as the 11:00 p.m. afterglow faded to full darkness.

During the first two weeks, we and they spent a good deal of time discussing their scientific needs for research. They needed a good UV-VIS spectrophotometer, a good fluorescent microscope, a grow chamber, vials and solo medicine cups in which to grow different cultures of algae with different nutrient balance and metal ion contents. Of course, computers, calculators and space were needed. Each day they took one of our boats on their daily rounds checking sample sites, bringing in filtered water and new samples.

Canyon Ferry Reservoir is the uppermost large reservoir on the Missouri River, making an impoundment about 23 miles long and 163 feet deep. At its widest point, it is only three miles wide. It is important in that it serves as the first real sediment trap and chemical sink on the river. By the time the Missouri has entered Canyon Ferry Reservoir, it has drained 43,000 square miles of wilderness, ranch land, and medium sized rural communities.

Perhaps most significant within this drainage is the chemical load contributed by the hot waters of the Firehole River in Yellowstone Park. Much has been written during the past five years regarding the extensive arsenic loads coming from the hot solutions arising from within the park. Many tests of surface and groundwater have shown arsenic levels in excess of recommended EPA safe levels for drinking water.

As we worked together during the summer, it became apparent that much could be obtained by having students from our widely divergent cultures learn to work together. The students that accompanied the Kapkovs, Sasha and Masha, were 13 and 15 years old, respectively. They normally finish high school at the end of the eleventh year. If they show promise, at that time, they are allowed to enter a university within their town or area. They are generally not allowed to travel to some far off school, but are required to go to the closet college. In Moscow, this is Luminosov University or Moscow State University, a school with 50,000 students and 5,000 faculty members sharing one roof. Students are not charged for attending and in some cases, they are paid a small sum to attend. This fee schedule holds true through graduate school and on through their Ph.D. work.

Masha started slowly, but eventually realized that work at our institute required self-discipline and much self-direction. She eventually chose to study the food source for Daphnia pulex, a small water flea which has served often for tests performed at our institute. She dissected several thousand of the little beasties and came to the conclusion that a diatom, Coscinodiscus, was the food of choice. This was based on finding numerous empty silica shells of these wonderfully adorned circles with radiating puncta.

While we had always worked on obtaining just enough detail to prove a point, the Russians painstakingly pursued the finest detail. They truly showed us new meaning to discovery. We became intrigued by their methodology, much of which had not been written about in the readings we had seen over the past decade. Toward the end of the summer, we came to recognize the strengths that could be shared if we all had the opportunity to work together more often and more clearly.

We made the decision to plan a more active interchange of students who will be seniors and who will start the school year with one-half the group in Russia and one-half the group in the US at Canyon Ferry Reservoir. The students will be grouped such that girl-girl and boy-boy pairs will stay together during the entire year. Forty students at each site will base their entire senior year curriculum around ecological issues, especially those of water quality and water management. While in Montana, students will study both the Missouri and the Yellowstone River systems. While in Russia, the students will study one, possibly two rivers flowing northward from Moscow and emptying into the White Sea. Moscow State University has biological station located on the White Sea, just inside the Arctic Circle. This site is only reachable via plane and boat. Students will spend time at both the biological station and at Moscow State University.

Classes for these students will be held six days per week for 90 days. At the end of the first 90 days, there will be a long Christmas break and the students will exchange locations for the duration of the year. All students who successfully complete the course of study will be awarded a special diploma that will be recognized by the universities of both the US and Russia, a sort of international diploma.

The course of study will include the following:

1. English-technical writing
2. Math-Statistics and calculus as they apply to resource management
3. Comparative Government-propose and trace a piece of environmental legislation through the legislative bodies of both countries
4. Chemistry-instrumental analysis
5. Biology-biology of aquatic ecosystems
6. Computer Applications-word processing, CD-ROM data analysis, etc.
7. Foreign Language-English/Russian
8. History/Drama-develop a play about the history of each country to present to home audiences

As you look at this schedule, it is easy to see that it will be as rigorous, if not more so, than most seniors take. This is an experiment in "reformed" education. It is not an effort for the general masses.

Instead, this opportunity will be available only to students from both countries who have demonstrated a capacity for extra work, and who have already made a decision to pursue environmental studies at the college level.

We are convinced that the cross-cultural aspect of these studies will enhance student learning from both countries. The opportunity to investigate real-life problems surrounding this natural resource, water, will convince students that there are cross-curricular and interdisciplinary ties. Seeing first-hand similarities and differences in major watersheds on two continents will indelibly burn in the idea that this is indeed Spaceship Earth.

Funding for this project is being sought from a variety of sources including tuitions, private foundations, governmental agencies, and donations. Your comments and reactions are appreciated.

Partners of the Americas and Environmental Education

Kay Antunez de Mayolo and Melva Okun
Partners of the Americas
Sacramento, CA

Introduction

Partners of the Americas is the western hemisphere's largest voluntary organization engaged in economic, social development and technical training while at the same time fostering inter-American friendship and cooperation. Founded in 1964, today it is a private, 501(c)3 non-profit organization, managed by volunteers in 60 partnerships. Projects that the partnerships develop are mutually beneficial cultural and education exchanges that at the same time carry out development projects in critical areas such as forestry and natural resources management and conservation, environmental education, and many vocational, youth and leadership development programs.

Environmental and conservation education have played an important part of most partnership activities during the past thirty years. Forty-five states, many with several partnerships, have developed projects with their counterpart countries, regions or cities that focus on environmental issues. These projects, organized entirely by volunteers, are often carried out by committee members from both sides of the partnership. Recently an emphasis on youth volunteers has opened opportunities for additional environmental education and action.

Discussion

The range of projects represent the environmental and human needs of the continents and islands in the western hemisphere. Assessing the local issues related to natural resources and environmental concerns is the basis for initiation of any Partners project. Critical also is the network of human resources which is what members of each partnership bring with their volunteer support. For example:

- a Panamanian marine biologist, under the auspices of the Delaware-Panama Partners, was invited to study the reproductive cycle of scallops at the University of Delaware's College of Marine Studies. The training provided background for several Panamanian scientists to look for ways to curb the alarming rate of overfishing in Panama's bays and to increase production of these commercially important mollusks.

- the Ecuador-Kentucky Partners developed a forest nursery in the protected Pascocha Forest near Quito, with the goal of promoting the conservation of native species, a radical change from the focus many developing countries have taken as they introduce exotic species for commercial export.

- Guatemala Partners, with the support of their Alabama Partners and several conservation organizations such as the World Wildlife Fund and the National Park Service, responded to the alarming destruction of the fragile tropical forest areas in the Peten region, home of many species of birds and mammals such as the jaguar. Following a conference through Partner's exchange program, they began to work closely and were able to ensure that these areas were set aside for national parks and preserves. In recent years, efforts have focused on increasing the public's awareness and appreciation of the region by conducting environmental education workshops for teachers living in the area.

Throughout the years, Partners committees have collaborated with national environmental education programs such as Project Learning Tree (PLT). Educators from the southern hemisphere Partnerships have attended PLT workshops during exchanges in Vermont, Alabama and North Carolina. Recently National Partners has initiated a project to introduce PLT into several regions of Brazil. Leadership workshops and efforts to translate PLT activities both culturally and linguistically have begun.

Partners and Youth Serving Programs

Involving youth in the Partners' activities has increased in recent years with the support of the W. K. Kellogg Foundation. Partners participating in the International Development Fellows program, a two year program funded by the Kellogg Foundation, have initiated a variety of environmental restoration and environmental education projects. Fifth grade students in New Mexico were introduced to factors that influence on the protection of endangered species such as the sea turtle of Tabasco, Mexico. Working with a number of educational institutions and environmental organizations in Mexico, the New Mexico children learned about the how economic conditions, traditional attitudes and behaviors have influenced and affected preservation efforts.

The coordinated educational program in Tabasco and New Mexico included an awareness program initiated by a poster contest which lead to students organizing an environmental club.

Other youth activities have included student exchanges where groups from several regions and cities in Mexico have joined with youth from U.S. Partnerships. Also funded by the Kellogg Foundation and Partnership fund raising activities, many of the exchanges have offered youth from low income and multi-cultural backgrounds, the first glimpse of life on the other side of the border, both north and south. These exchanges, lasting from two to six weeks, have brought youth together to learn about how volunteers can participate in environmental action projects while helping to develop their leadership skills and interest in the environment. Community forestry, stream restoration, barrio garden projects, tree nursery work and environmental day camp leadership activities are a few of the activities carried out by the environmental and community service youth exchanges.

Conclusion

Partners of the Americas offers environmental educators an opportunity to develop projects that focus on both the local and global range of environmental issues. Using the people-to-people approach and by collaborating with many programs such as Project Learning Tree and the World Wildlife Fund, many new audiences in the western hemisphere can be reached and the effect of the efforts multiplied manyfold.

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Australian Teacher Education in Environmental Education

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Australia has a long history of environmental education going back over 40,000 years. The Aboriginal peoples established a human ecology which was in harmony with the natural ecology. The land was respected and loved as a mother. Indeed, the land was considered sacred by Aborigines. The land was created by ancestral beings, some of whom had supernatural powers. These ancestors of the Aborigines are believed to be still living in the environment, in spiritual form, continually regenerating life. The land not only yields resources to sustain life, it *is* life. Pat Dodson of the Federation of Land Councils and the Chairperson of the Australian Reconciliation Council describes the Aboriginal land ethic in this way:

> For the Aboriginal people land is a dynamic notion; it is something that is creative.... Land is the generation point of existence; it's the spirit from which Aboriginal existence comes. It's a place, a living thing made up of sky, of clouds, of rivers, of trees, of the wind, of the sand, and of the Spirit that has created all those things; the Spirit that has planted my own spirit there, my own country... It belongs to me; I belong to the land; I rest in it; I come from it (Dodson 1976).

The Aboriginal people had elaborate systems for codifying their knowledge of the land, its cycles, the need to respect it, and the management practices that would allow them to use the land and its resources in a sustainable way. This knowledge was passed down through the generations through stories, dance, ceremonies, and the establishment of a network of sacred places. The Aboriginal system of environmental education continues today through family relationships and through special programs in Aboriginal community schools and even in some progressive non-Aboriginal schools.

However, the Aboriginal vision of the land has not been accepted by non-Aboriginal Australians despite the work of many committed people over the last two centuries. Historical records show the new Australians wantonly pushing further and further inland with little thought for the environmental destruction they caused or the people they dispossessed. Judith Wright (1981) described this process in her book, The Cry for the Dead:

> As time went on, the Aborigines retreated or were driven out of whole territories into the inhospitable foothills... The land itself was now disfigured and desecrated, studded with huts, crossed by tracks and fences, eaten thin by strange animals, dirtied and spoiled... The all-embracing art of life and spirit which held all things together was in tatters.

It is against this background of environmental problems and changing social values and environmental practices that environmental education developed in Australia from the 1970s onwards.

Providing a detailed picture of environmental education in Australia is difficult due to the complex nature of the education system in this country. Australia has three levels of government-Commonwealth, State/Territory and local with the first two being responsible for education. The operation of eight State and Territory education systems in a country with such a small population as Australia is very expensive and leads to much duplication of effort. Nevertheless in 1989, the Commonwealth, State and Territory Ministers for Education agreed on the Hobart Declaration of ten "Common and Agreed National Goals for Schooling in Australia." One of which includes "the need to develop in students an understanding of, and concern for, balanced development and the global environment."

A national pattern of inattention to environmental and development education, its partner in education for sustainable living, characterizes pre-service teacher education programs in Australia. A comprehensive review of 1992 university handbooks revealed that no pre-service teacher education program in Australia mandated environmental or development education studies. There are no electives in development education and only a few universities provide course structures which allow students to study a one semester elective in environmental education or to choose to specialize as environmental education teachers.

There has been no national review of the place of environmental education in teacher education programs. However, an indication of the general national neglect of environmental education can be ascertained by reference to the results of a survey by Helen Spork. This study found that only 4.9% of primary teachers had ever undertaken any studies in environmental education. Over 85% claimed that they had received no training at all in environmental education through their pre-service teacher education courses, in-service training workshops (only 6.6%) or post-graduate studies (only 3.1%).

The Australian Association for Environmental Education has been eager to encourage these signs of interest in pre-service education and has developed the *Environmental and Development Education Project for Teacher Education* to provide a guide for teacher educators on ways of incorporating education for sustainable living into their teacher training programs.

The project has involved twenty educators drawn from eleven universities, government departments, and NGOs across Australia in writing and trialing a set of eighteen three-hour workshop modules on environmental and development education for use in pre-service teacher education courses. These modules are published in a project manual, titled *Teaching for a Sustainable World*, illustrate how environmental education and development education are related and provide practical assistance for teacher educators who would like to include these important fields in their programs. A listing of the themes addressed in the eighteen workshops follows:

Introduction to Environmental Education
Introduction to Development Education
Exploring the Links-Environment and Development

Introducing Alternative Futures
Appreciating Sustainable Futures
New Science-A New Worldview
Analyzing Educational Resources
Teaching For Ecologically Sustainable Development
Consuming For Sustainability
Health, Environment and Community Development
Community-Based Environmental Education
Community Action for Sustainable Development
Soft Toys Know About the Environment Too!
Women, Environment and Development
The Population-Food Debate
Traveler or Tourist: Tourism in the Developing World
Waste Management and Future Problem Solving
Personal Power and Planetary Survival

The first three workshops provide an introduction to environmental education, an introduction to development education, and a way of seeing the linkages and similarities between environmental and development education. These three workshops may be considered as a hub while the remaining ones are spokes that address particular themes and specialties in environmental and development education and may be used in any combination and sequence but, preferably, after the three core workshops have been completed.

During 1993, a series of project dissemination workshops was held for all teacher education schools and faculties in Australia. All who attended were provided with a free copy of the project manual, *Teaching for a Sustainable World*. As well as introducing participants to the modules, the dissemination workshops encouraged plan strategies for introducing education for sustainable living into their teacher education programs. It has been found that there are three major ways in which this may take place. First, the materials may be used as the basis for a linked program of professional and curriculum development. Familiarization with the concepts developed in these workshops and experiential learning strategies common to them provide new skills for teacher educators and new ideas for existing courses and programs. This may also provide a body of ideas and criteria to assist in the review of existing teacher education programs and may assist decisions about the goals, content, structure and approaches to be adopted when new programs are being designed. Second, the modules in *Teaching for a Sustainable World* may infused-exactly as they are but, preferably, with local adaptations-into a range of existing courses in a teacher education program. Third, the workshops could be used as a set-again, preferably, with local adaptations-for a core or elective course/subject/unit in education for sustainable living.

Another recent development in Australian teacher education is enhanced distance education at the advanced level. The first specialist Master of Environmental Education degree program in Australia began at Griffith University in the Faculty of Environmental Sciences in 1991.

During 1991-92, the four core environmental education courses in the Griffith University Master of Environmental Education program were developed into off-campus mode in co-operation with Deakin University with funding from Commonwealth government especially to expand access to mid-career professional development studies in environmental education. These four courses were available in the off-campus Master of Education from Deakin University from the beginning of 1993.

Taken together these two initiatives greatly enhance opportunities in Australian teacher education in environmental education. They also provide effective models for North Americans who are only beginning to work in development education and distance education in environmental education.

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Using Protected Areas for Rainforest Education—A Case Study in Belize

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Background

The dilemmas of tropical rainforest preservation have captured the attention of teachers and students worldwide. In countries where rainforests still thrive, environmental educators are struggling to increase public awareness and understanding of these magnificent ecosystems before they vanish. There is much potential for this in Belize, where relatively large forest areas are being set aside for protection. One well-known area is the Cockscomb Basin Wildlife Sanctuary and Jaguar Preserve. Due to international attention, Cockscomb is receiving increasing numbers of visitors. During the first four months of 1992, the number was over 1800. However, less than 15 percent of these visitors were residents of Belize (a figure that includes tour guides and resident foreigners). One reason for this lack of local visitors is that the area is quite remote. One must have considerable motivation, or access to a vehicle, to travel the 6 miles from the main road to the Sanctuary's entrance. In addition, some people may not be aware of the purpose of protected areas, or know what to do once they arrive. One student said of her fellow Belizeans, "A lot of them don't like bush." Another student confessed that before she visited Cockscomb, she thought it was a place where people could collect animals to take home. Such statements indicate that efforts in environmental education are not meeting current trends in environmental protection. A resident environmental education program for high school students like the one piloted in this study can help fill this need.

A survey of 177 Belizean high school students revealed that they generally had positive attitudes toward the environment and conservation. About 60 percent reported visiting one or more protected areas in the past, generally on a school-arranged outing. Interestingly, students who had these opportunities did not appear to have more pro-environment responses than students who never had a chance to visit a protected area. One possible reason for this is that visits were short. Of the students who had previously visited a protected area, about 73 percent stayed only a few hours or half the day. A very small number (4.6 percent) had stayed overnight. As Shepard and Speelman (1985/86) note, resident programs of five days in length appear to have a more positive effect on attitude development than shorter visits. Unfortunately, opportunities for longer visits are rare in Belize. This suggests that more efforts need to be made in utilizing protected areas for environmental education.

Another important survey finding was that female students in general had less pro-environment responses than males. This may be related to the fact that most of the girls surveyed had a "business" emphasis in their courses, while boys were more likely to take "science" or "academic" courses which more often deal with environmental issues. In addition, male students were 20 percent more likely to have visited a protected area than female students. These findings pinpoint the need for girls and young women to be targeted in environmental education efforts.

A Five Day-Residential Program

Addressing these concerns, a pilot five-day residential program was developed for Cockscomb. Two small groups of female high school students from a small town were invited to participate. At Cockscomb, students were led in a variety of educational activities, among them the following:

1. Trail hikes and "river floats" provided students with opportunities to explore and observe, as well as learn about nature
2. Night walks directly confronted student's fears of the forest and its real or perceived hazards. Use of flashlights encouraged focused observation of things easily overlooked during the day, such as spiders, moths and small blossoms
3. Group discussions allowed students to voice their feelings about the environment, and examine their attitudes toward nature. Students were also introduced to various environmental concepts
4. Cockscomb Staff and a local youth activist talked to students about the role of Cockscomb in conserving the natural resources of Belize, and the importance of becoming involved
5. Books and other materials were available for students. Many used field guides and binoculars to identify birds.
6. An "Action Project" was chosen, planned and completed by students, in which they combined their knowledge, feelings and creative abilities to teach others about Cockscomb

Cockscomb was an ideal setting for making rainforest education fun. The aspects of novelty, challenge, participation, choice, and cooperation were easily incorporated into the activities (Brophy, 1987; Stipek, 1988). Floating down the river, walking at night with flashlights off, and climbing the waterfall all challenged the students in novel ways. The discussions allowed students to respond actively, which made them feel comfortable and allowed the exchange of ideas. Finally, for the action project, students worked together on topics and strategies of their own choosing. In the end, they had products that they “owned” and felt proud of.

The learning objectives were the same for each group but the methods differed, which provided comparative data from a qualitative research perspective. The first group participated in activities that were more recreational. Teaching and learning were "bottom-up," as students pursued topics that interested them. The second group of students participated in more structured activities, emphasizing ecological concepts and the importance of rainforests. "Bottom-up" learning also took place with the second group, but there were fewer opportunities for students to casually voice their feelings and opinions.

Individuals in both groups exhibited positive changes both in attitudes about nature and in understanding certain environmental concepts. Partly due to the different educational methods, different types of changes were observed in each group. In the first group, there were more positive changes in attitudes and appreciation of the environment. In the second group, there were more changes in the students' grasp of environmental concepts. In addition, the "action project," of the second group (a newsletter article) reflected more in-depth learning.

One exciting result was that some students in each group noticed themselves they had changed, for example:

- Whenever I home, I never did notice the birds. But now I like [to] watch them.

- I said I would [kill a snake], but now I [don't] agree, because I notice they no fool with me.

- Maybe this might be [my] future life...maybe be like [you], go study in a the bush.

A qualitative questionnaire administered both before and after the program summarizes some of the attitude changes. Table 1 shows questionnaire items where improvements were seen in the two groups as a whole.

1. I would like to go for a walk in the bush by myself

	Never	I'm not sure	Probably	Definitely
pre-program	7	0	1	2
post-program	0	1	3	6

2. I would like to walk in the forest at night

pre-program	4	0	3	3
post-program	0	1	0	9

3. I would like to have a tiger (jaguar) skin in my house for decoration

pre-program	0	2	2	6
post-program	6	1	3	0

4. If I saw a snake in my yard, it would be best to have someone kill it

	Agree	Disagree
pre-program	8	2
post-program	3	7

5. The zoo is the best place for wild animals to live

pre-program	9	1
post-program	1	9

Table 1: Selected data from qualitative questionnaire
(Total of 10 individuals)

Conclusion

While many Belizean high school students have the opportunity to visit protected areas, the majority do not have more than a few hours to become acquainted with the natural surroundings. There is a need for people to not only spend longer periods of time in protected rainforests, but to learn of their importance and value. Most of the students who participated in the educational program had no particular interest in Cockscomb or in nature before the visit, but they left with a higher appreciation and understanding. With this in mind, local support for protected areas should increase if such an educational component can be implemented.

This is clearly a difficult task in Belize. Effective educational programs are made up of many components that are expensive and difficult to arrange, such transportation, food and accommodation. Also needed are staff, teachers or volunteers who have the time and commitment to make the experience meaningful to students. Still, the potential of such programs cannot be ignored, if protected areas are to benefit Belizeans. In school, students can learn about the important reasons why the government has placed a great deal of public land under protection. But in the classroom, children cannot study nesting birds and jaguar tracks, or hear howler monkeys and toucans. To learn that a healthy ecosystem is wonderful to experience, and that the rainforests of their country are fascinating and alive, students must have the opportunities to experience them first hand.

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A Multimedia Resource Pack—Understanding Our Environment

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Introduction

Understanding our Environment was sponsored by DuPont and its affiliate Conoco with the intention of making a serious and meaningful contribution to the environmental education of young people.

Corporate Sponsorship-The Commitment

Many companies support environmental initiatives-but not always without strings. The funding for the development of Understanding our Environment was not only provided without pre-conditions; the educationalists and others who were to receive the material were directly involved in deciding the format and content from the start.

Initial Survey-Determining Needs

The sponsors commissioned a study to survey teachers, environmental educators, politicians with active educational links as well as representatives of the business community and governments to determine what *they* considered to be the areas of greatest need.

The response indicated a need for: **"clear, direct, ready-to-use resources, that have curricular and practical relevance"**. It was also clear that there had to be scope for active participation on the part of pupils and practical suggestions for teachers on how to use the resource.

As a result of the survey the following requirements were identified:

1. Audio visual support material
2. Classroom resources (photocopiable)
3. Background reference materials and technical information
4. Briefing documents on the uses of the resource

Educational Design and Evaluation

The Production Team

Educational Evaluation. The educational production and evaluation of the resource started in January 1991. Professor John Elliott of East Anglia University, who was at that time leading an OECD 19-nation environmental education pilot scheme, undertook to provide the educational evaluation of the project.

Authoring-Rupert Booth, HMI. The design and authoring of the resource was put together by a team of environmental educators of international standing. The team was headed by a former inspector of schools with responsibility for environmental education.

Educational Video Production. The production of the supporting video is realistic in that no provision was made for re-takes to show "model" examples of how environmental education should be undertaken.

Local Education Authority Commitment and Collaboration. As is usual in these projects, once the commitment of a reputable team was obtained, it was possible to enlist the support of an entire education authority in the UK who volunteered its active support in the trailing and development of the materials.

An International Perspective

First Drafts to Norway, Holland, France, Germany and Spain

The draft materials were sent to those who showed an interest in the concept at the outset and views and comments were invited. This consultation was intended to keep the broadest possible perspective in the content and illustrative treatment of the materials.

Prompt responses were received, identifying a range of needs and the importance of clarity and directness in all of the material.

Understanding Our Environment-The Contents

- Video
- Users guide
- 7 Sections covering Planet, Air, Land, Water, Life, People, Challenges (each of which contains information and activity sheets)
- Fact File

The layout of the video content corresponds to the structure of the printed resource materials. It is intended to complement the information found in the activity sheets and provides a starting point for the school activities.

The pack addresses a comprehensive range of environmental issues. Its philosophy is simple and direct: "to give children a broader, more informed perspective on environmental issues so that they will be in a position to make judgments and take action based on a clearer understanding of the nature of environmental issues".

Pack Structure

The authors of the resource consider that young people must take away a holistic understanding of the environment to enable them to make informed and balanced judgments about the future. They must understand the relationship between the natural environment, our use of its resources and the need to allocate the wealth produced by these resources between our needs, our demands, the welfare of human society and what must be returned to the environment. Hence the depth and breadth of the issues contained in the resource.

Using the Resource

Exemplar: Investigating Water

To use this component a teacher would show a brief excerpt of the video to give some ideas of how the topic is introduced.

This leads to a variety of activities such as collecting water samples, analyzing the contents, carrying out surveys and other water related investigations and activities. The activity and information sheets are designed to be used on a stand-alone basis, although many lend themselves to use in longer term projects and will, of course, be supplemented by many excellent resources already in existence.

The study of water topics can lead to the role play on water pollution in the Challenges section and this involves a framework which requires input from all sections of the pack as well as the community in resolving local issues.

Video-School Reports

Each section of the video features a school report which contains examples of how a school or schools have adapted the resource materials to their own needs. They demonstrate how environmental education can be incorporated into standard school curriculum activities.

Curriculum Models

Options:

- A free-standing environmental course
- Cross curricular through subjects
- Extending one or two carrier subjects
- Working through cross curricular themes
- Periodic suspension of timetable to pursue an environmental matter within the life of the school community

Dealing with Complex Issues

In the design and development of the resource, careful consideration was given to a major objective of the on-going OECD project, namely to look at how children learn to deal with complex issues. Some might say that this is the essential nature of education taken in its broadest context. In an attempt to provide useful material for dealing with complex issues, it is worth considering some of the themes raised in the Challenges section of the resource-pollution, energy conservation and recycling.

Role Play Exercises

Clearwater Case Study

One of the pages in the pack shows a fairly innocent looking village and a few of its industrial and local environmental features. There is a dramatic report in the local newspaper that a number of fish have been mysteriously killed in the river. Participants in the role play are provided with briefing papers informing them of their particular role, either as a local farmer, manager of sewage works or an employee in the local paper mill.

The intention is to help pupils to realize that many environmental issues are, by their nature, complex and that when it comes to environmental pollution there are few non- contributors.

Enlisting Outside Expertise

The Clearwater roleplay, the Energy debate and recycling issues all lend themselves to the use of external contributors to school activities and debates.

Progress to Date

National Response

The response exceeded our highest expectations in that advisory staff for a large number of education authorities responded in a positive and active manner to undertake use and dissemination of the resource immediately.

International Response

The resource was also presented in France and Spain for perusal by national education authorities as well as practicing teachers.

France, Spain, Ireland, Poland, Holland and Germany all expressed an interest in using and adapting the resource. So far, 3 countries have done so.

Comments Received

- ...the most impressive and lavishly produced work of its nature to reach our schools in the past decade. (Inspector Environmental Education, Staffordshire CC).
- ...a truly excellent resource. (Adviser Environmental Education, Dorset Education).
- ...valuable resource for those dealing with the complex environmental issues we face. (Minister for Overseas Development).

Planet Earth Exhibition

This is a walk-through experience which complements the Understanding our Environment resource.

The first half of the exhibition consists of a simulated time travel from the edge of our galaxy through to a close-up on the formation of our solar system and the development of the first signs of life on earth. The visual presentation takes place in a darkened tunnel with spectacular images providing a powerful dramatic effect to complement the Walkman commentary.

The second half, starting from the Blue Planet, progresses through the main themes of the pack-Land, Air, Water, Life, People and Challenges. The exhibition ends with a computer touchscreen quiz which tests the knowledge gained from the environmental experience.

Working with the Sponsors

Non-prescriptive Approach

After agreeing to the outline structure of the resource, the sponsors took no further part in the design, development and testing of its contents. They have, of course, remained closely involved and interested throughout and continue to provide valuable encouragement, ideas and funding for further dissemination of the pack. The sponsors continue to feel that they as a corporation benefit from this initiative.

The pack is sold at a price that represents its reproduction and handling costs only.

Körlánc—An Hungarian/American Environmental Education Project

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Background

With the change in the Hungarian government system, there has begun a renewal in public education and the school system. The government coalitions and the opposing parties all agree that there are justifiable reasons to rebuild the school system from the past forced, bureaucratic, uniform, impersonal form that it possessed in past decades. The goal of pluralism, to return control over the needs of education and the push towards creative schooling to local government and citizens, is an important aspect in the new independence. The passing of the new education law in the summer of 1993 has guaranteed this newly won independence. With this new law, the possibilities are growing for more independent focus in schools and that local citizens can be more involved. Underlying this independence is the National Core Curriculum which can be met in various ways that meet equivalent goals of education.

In the past, the entire public education system bore the heavy stamp of the past regime. The rules were unbending, there was a lack of teacher capability and the subject material was outdated. These manifestations are still obvious in the present weakness of environmental education in Hungary.

Educators become accustomed to a system where curricula were distributed from a central point and they exerted the least effort possible to meet the demands from this central office.

At the same time, there was a lack of teacher training, no textbooks and no teaching manuals about environmental education. In the day to day life of kindergartens and primary schools, there was little chance for environmental education to grow. The confusing conceptual interpretation of environmental education put the brakes on educational research. Little attention was paid to national public opinion and behavior in sociological investigation.

In spite of all of this, an awareness and a demand for an environmental culture grew through citizen's life experience. Up to the present, environmental education was only in the form of conceptual explanations. Even a few years ago, no one would have thought that public school environmental education, based on national education standards and local preparation of curricula, and refined through reciprocal and coordinated teamwork and local sustainable citizen connections, would have been possible.

In these stormy times of change in the school system the Körlánc Project was born. Its mission has become clear. At the soonest, the project must help with many areas of environmental educational development, so that the changes in the national education system will provide a unique opportunity for growing participation and promotion. The Körlánc project works together with local citizens and the schools to try new ways of involving the local population who are at this new cross-roads. This program also helps to build connections between citizens and their local governments in the area of education policy development.

The Birth and Work of the Körlánc Project

In the Spring of 1992, a Hungarian professional delegation, at the invitation of the US EPA, made a study trip to the USA to various cities with the goal of observing how environmental education was taught. In the course of this trip an agreement was reached with the International Department of the EPA, the Vermont-based Institute for Sustainable Communities and the Hungarian Ministry for Environment and Regional Policy to develop a joint project. The goals of the Körlánc Project:

- Make an effort to involve local citizens into environmental education program development, trials and their diffusion.
- Bring a close connection between national teacher training institutions, and a limited number of environmental education research institutes.
- To give access to pilot project models, teaching materials and products of these working groups to interested citizens, respective localities, the immediate region and neighboring countries.
- With the assistance of the ISC to adapt environmental education materials to the Hungarian education system and culture.

The two working groups strive to provide information quickly and without cost to schools and kindergartens. There are now more than 250 associate members of Körlánc. The project also strives to create national links and partnerships between innovative kindergartens, primary schools, teacher training colleges and continuing education institutes. The project assists and growth of and import and adaptation of education programs, the transmission and development of needed information and materials to assist teachers, new teaching methodologies and to internalize these in the areas of teacher training and continuing education.

The Floors of the Körlánc Building

Within each working group, there are three separate levels of activities. The project resembles a three story building.

1. Public participation in local environmental education in kindergartens and primary schools.

One Körlánc working group is in Esztergom and the other is in Kecskemet. Both teams are associated with the Science Faculty of a local teacher training college because it was normal for environmental education to exist within the framework of the science faculties in the past and at present. The Science Faculties can assist the practice school teachers with working out local curricula with the environment as the focal point. It is very difficult to work to integrate environmental awareness activities and knowledge into every subject area--not just the hard sciences where it has traditionally resided.

In the first school year there were many progressive elements proposed for the education plans. Excellent cooperation was evident, throughout this turbulent process, between the working groups in their primary school activities and teacher training and continuing education work, all of which is open to public scrutiny and the press.

In the kindergartens and schools there were Körlánc activities every day. There has been increased awareness of and participation in the development of trash separation and recycling programs, a preference for workbooks made of recycled paper, the use of environmental protection and natural themes in lessons and educational competitions, artistic presentations and exhibitions, health awareness and improvement programs, and the development and strengthening of good habits.

2. In both working groups there has been a special student team built and supported to assist in Körlánc activities.

Students are informed of Körlánc activities through their student forums and programs. Students regularly take part in activities with their teachers at Körlánc workshops, connecting with kindergartens and primary schools on open days, working with ecological programs and in all other Körlánc activities as they choose.

One outstanding, nationally recognized program that the Esztergom working group developed and ran was a National Environmental Education Teaching Competition which focused on typical subject area environmental education possibilities.

From the viewpoint of national teacher training, development of a 5-semester program that concentrates on environmental themes has begin. This program will create professionals who can become environmental education "choir conductors" in the schools.

3. The teacher training colleges' Körlánc working groups have worked on planning and arranging a continuing education program for teachers within their teaching system.

In the area of continuing education the working groups focused their efforts on planning, organizing and delivering workshops. In total more than five hundred primary school teachers, kindergarten teachers, headmasters, professors, local governmental and non-governmental activities and parents participated. The continuing education programs built intricate international connections between the Institute for Sustainable Communities and the Körlánc Project Office.

One central Körlánc goal was to develop a clearing house function. To this end, we developed a monthly Körlánc Newsletter that was sent to hundreds of schools, kindergartens. This publication is concerned with questions about elements of environmental education, methodology, Körlánc activities, other programs, words of wisdom critiques, letters and book reviews. It also contains poetry and creative pieces from members.

The first twelve months of the Körlánc Project have drawn to a close. I am sure that our work will continue and be successful in the end.

A Rationale for Participatory Research in Environmental Education

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Recent Developments in Environmental Education in Canada

Introduction

The purpose of this paper is to provide a perspective on the ongoing struggle to incorporate environmental education into the Canadian education system. Recent initiatives in the areas of education and environment are described in order to establish a rationale and a context for Canadian environmental education activity. The paper then raises the issue of the relationship between the intentions of large-scale policy documents advocating sustainable development and environmental citizenry and the realities of current educational practice. It is argued that the educational foundations of Canada's conservation strategies intend far more profound changes to the education system than notions of incorporation imply.

A Context for Environmental Education

When I was preparing a paper for the UNCED conference in Rio, early in 1992, Andre Guay of Environment Canada sent me a document that described progress on Canada's "Green Plan," a six-year, three billion dollar national action plan for the environment during its first year. The document quoted Canada's Environment Minister, who stated that the federal government had announced or begun work on 36 major initiatives, including a federal waste reduction plan, a pulp and paper regulatory package, a Canada/US Air Quality Accord, an energy efficiency act, and a research program in environmental studies for Canadian universities.

Canada's Green Plan was prepared by the Government of Canada in 1990 following cross-country consultations with thousands of citizens and stakeholder groups. In the *Summary* booklet, the Prime Minister described the Green Plan as an expression of federal commitment to manage resources and encourage sensitive environmental decision making-as a commitment to our *children*. Although participants in the Green Plan consultation sessions (Government of Canada, 1990) recommended that the federal government develop and implement a national environmental education strategy, the Green Plan does not contain an educational component. Because education is a provincial jurisdiction within Canada, the federal government has been reluctant to prescribe or to mandate or to even propose change in education.

On the provincial front, at about the same time in 1992, I was working on a provincial committee charged with the task of developing "an education strategy for sustainable development in Saskatchewan." The committee was an education advisory committee to the Saskatchewan Round Table on Environment and Economy. In 1986, a National Task Force on Environment and Economy (established by the Canadian Council of Resource and Environment Ministers [CCREM]) had initiated dialogue on environment-economy integration among Canada's environment ministers, senior executive officers from Canadian industry, and representatives from environmental organizations and the academic community. This Task Force did not shy away from the educational recommendation that the nation's children be given substantially improved environmental education at the elementary and high school levels. The Task Force also recommended the creation of National and Provincial Round Tables for the purpose of developing "conservation strategies" in every Canadian jurisdiction.

The subsequent creation of Round Tables on Environment and Economy resulted in more provincial activity directed toward environmental education. For example, the Saskatchewan Round Table's Education Advisory Committee developed a specific education strategy which included a mandate for environmental education. Similar education documents and materials were, and continue to be, developed within each province and region of Canada. Key recommendations in the Saskatchewan education strategy included the following: incorporating environmental education and sustainable development concepts and values into all curricula and programs within the formal education systems of the province; identifying, promoting, and practicing effective instructional approaches that promote environmental education in the professional development of teachers; and ensuring that public education programs meet the continuing need for environmental citizenship education.

The concept of environmental citizenship is found in a number of government documents in Canada. For example, in preparing for a recent Trilateral Meeting on University, Community, and Environment in Mexico City (an event proposed in the Memorandum of Understanding among Canada, the United States, and Mexico, signed in September 1992), I found the following statement in a March 1993 Trilateral Committee paper entitled, "Proposal for an Activity Under the Trilateral Memorandum of Understanding on Environmental Education":

In the Trilateral MOU, environmental education is defined as "a permanent process in which individuals and the community gain awareness of their environment and acquire the knowledge, values, skills, experiences, and also the determination which will enable them to act-individually and collectively-to solve present and future environmental problems." Environmental literacy is described as "a basic functional education for all people, which provides them with the elementary knowledge, skills, and motives to cope with environmental needs and contribute to Sustainable Development" (Article I -Definitions). The term "sustainable development" has been the subject of much debate, both in Canada and elsewhere. Rather than get into a semantic/philosophical debate on the scope of environmental education, the Canadian delegates propose that the all-inclusive term *environmental citizenship* be adopted as the goal that environmental education should address.

The Canadian delegation, familiar with the rhetoric and the political nature of the term *sustainable development*, consciously chose to adopt **environmental citizenship** as the goal.

In my view the environmental citizenry goal is consistent with environmental education thought as it evolved from the Stockholm conference, through the Tbilisi Declaration, the Belgrade Charter, and the aspirations of the North American Association for Environmental Education (NAAEE). During the 1980s, environmental education continued to be recognized as an essential component in the resolution of environmental problems. However, with wider involvement of groups from business and industry the term *sustainable development* began to appear as an alternative to *environmental education*.

Canada is a large country with geographical barriers and cultural differences. It will be interesting to observe how this tension among slogans embedded within the rhetoric of national and international documents is translated into school programs in each region. Obviously, communication will be important as we move to incorporate our notions of "environmentally appropriate" education.

More Recent Developments

Where are we in 1993? Canadian environmental educators are actively involved in many projects spawned by federal initiatives. But can we say that environmental education is infused into the educational thinking and planning activities of Canada's teachers, generally? McClaren's (1989) concern that, because of the separation of federal and provincial responsibilities for public education, federal rhetoric is rarely translated into local action, remains. Despite the clarion for environmental citizenship based on environmental education aimed at fostering a new environmental ethic, environmental education is not an integral part of each child's education in Canadian schools. Although Saskatchewan has included a science-technology-society environment (STSE) dimension of scientific literacy in a new provincial science curriculum and Alberta has a very active Friends of Environmental Education Society of Alberta (FEESA), and despite the work of a small army of committed individuals working locally in many regions of the country to build environmental education within provincial schools and nonformal sectors of education, in the words of one national leader, "We have a lot of work to do."

Earlier this year, through an initiative of the Canadian Teachers' Federation, Environment Canada and UNESCO-Canada's Man and the Biosphere education network, a widely representative group of educators assembled in Merrickville, Ontario to establish a new Canadian network for environmental education under the acronym EECOM (the Canadian Network for Environmental Education and Communication). EECOM was conceived for the express purpose of improving environmental education communication and networking within Canada. It has established several working groups in areas of constitution drafting, fund raising, and electronic networking. An interim Steering Committee is working toward regional meetings as well as a national meeting in 1994 or 1995, perhaps in the province of Quebec. I believe that the work of EECOM and of environmental educators in Canada is crucial to our country's goal of an environmentally literate citizenry. The policy documents have been developed to impel us toward that goal. However, incorporation of environmental education into our school system is another matter-a matter of provincial education planning.

Conclusion

As a Canadian environmental educator, I suppose that I should be encouraged by international and national developments that, in effect, increase the pressure on provincial education departments (ministries) to act on policy initiatives. From formal submissions to the World Conference on the Human Environment in Stockholm in 1972, through Agenda 21 of the United Nations Conference on Environment and Development in Rio de Janero (1992), countries have been encouraged, poked, and prodded to integrate environmental issues into existing curricula. While the current level of activity is encouraging, I am not certain that broad incorporation of a concept such as environment education is possible through standard curriculum development and implementation channels.

The problem remains that although Canadian commitment to global environmental quality seems impressive, perhaps exemplary, our track record of successful implementation of educational change is questionable. As McClaren (1989) states, "a lack of ongoing federal, provincial, or local school system support for innovation in terms of coordination, professional development of teachers and implementation is evident." I have argued before (Hart, 1990) that failed implementation stems from fundamental deficiencies in our dominant (RDDA -research, development, diffusion, adoption) models of curriculum development-deficiencies that assume independence between policy setting and school practice so that the operational form of an innovation (practice within existing school patterns) is incapable of meeting its rhetoric (theory). Unless we reconceptualize this curriculum development process, we may think that we have accomplished much more than our children are able to experience.

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The Ajusco's Environmental Education Program

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The growth of Mexico City originated irregular urban settlements in the Ajusco hills zone, causing widespread disturbance on the pine and oak forests and on the very rich xerophitic shrub. In 1989 the Mexican authorities expropriated 727 hectares of the most recent illegal settlement, demolished the houses, reallocated the invaders and declared it a protected area.

The authorities of the city, together with the National Autonomous University of Mexico signed an agreement to develop the restoration work on the most affected area (200 ha) and to instrument an environmental education program.

The area is important as a part of the aquifer recharge zone and because of its high species-richness an presence of endemisms.

The general objective of the project is:

- To restore the typical features of the original ecological structure of the property called "Lomas del Seminario", Delegación de Tlalpan, simultaneously creating the educational elements for an increase in the environmental culture and knowledge of the neighbors.

The educational program is addressed to the no-formal education sector, started in 1990 and its objectives are:

- To involve the community of the Delegación de Tlalpan in the restoration project, in order to contribute in their process of becoming aware of the environmental problems and their solutions through active participation.

- To promote the understanding and appreciation of the natural environment of the area of "Lomas del Seminario".

These objectives were designed to be achieved during the following 5 years through different activities including conferences, radio and TV programs, acorn recollection contests, audiovisual presentations, children training in the selection and germination of acorns, ecological festivals and others. Up to the moment 70% of them have been fulfilled.

Given that the restoration included the plantation of oak juveniles, which are not produced in local tree nurseries, the first task was to obtain acorns. This program was implemented through an acorn's recollection school contest. The objective was to bring to the school all the mature acorns the children could find near their houses.

An audiovisual was designed to teach the children about the importance of preserving the Ajusco's forest, its role in the aquifer recharge and its biological richness, and the process of acorn germination.

Over three years, 40 schools and around 20,000 children have participated, collecting 33 tons of acorn which have been used in the project and in many other areas of suburban Mexico City.

During the project, the question arose of whether the audiovisual was an efficient teaching instrument for the relevant concepts. To explore this, we designed a survey to know how much of the information we taught through the audiovisual was retained.

We selected three treatments to be applied to the pupils of two schools that had not previously participated in the project: 1) a story to be read; 2) an informal presentation with slides; and 3) the audiovisual. The three treatments presented the same contents. After the application of each treatment, the subject was discussed and we applied the children a test of 10 items of multiple choice to be answered. Only children from grade 3 to grade 6 participated in the study to prevent low reading proficiency to interfere with the results. Pupils were randomly allocated to treatments. After 21 days we went back to the schools and applied again the same test.

We marked all the tests and obtained 445 pairs of them. In order to validate the instrument we made a contents analysis to see that each questions had a close relationship with the content we taught. We also obtained the discriminatory rate of each of the items. In the final analysis we excluded three items of low discriminatory power.

A nested ANOVA did not allow rejection of Ho: equal teaching efficiency of the three treatments. The marks in the first application of the test and those obtained 21 days after were not significantly different either. These results were puzzling. We expected the audiovisual to convey in a better way the information, and also for a detectable forgetness rate.

Given these results we hypothesize that the feedback was a variable that was influencing these good results. So we designed another survey. We chose a third school without previous experience of the Program. For this study we used only the audiovisual. We worked with the same age group pupils which were randomly allocated to treatments. One group was given feedback after the projection of the audiovisual and the other did not receive it.

Again, we could not detect any differences in treatments. Only the grades displayed a significant difference in marks, as should be expected.

To explore the possibility of previous knowledge of the concepts, we chose a further two schools, one public and one private, and applied the test before and after the presentation of the audiovisual.

A nested ANOVA did not show differences among schools and grades, but a very significant difference between the pre-test and the post-test.

The above results support the idea that the audiovisual is a very efficient way of helping the teaching of the concepts related to our study, as measured by the marks on the test, since pupils increased significantly their marks after its presentation. Discussion of the audiovisual do not appear to have a further effect. Marks remain high after a three weeks period, suggesting a high level of interest in the subject.

Besides the audiovisual, a text and a verbal exposition were used in the first study, and both present similar results in terms of high marks and non-detectable forgetness rate. Learning is significant regardless of the teaching instrument.

We propose the hypothesis that the information presented to the pupils is learned because it invites them to participate actively in concrete and viable actions directly related to a problem they perceive as important.

The subject is relevant to children because in Mexico City environmental problems are acute and there is a high degree of media coverage about them.

By involving the children in the process of solution of one problem familiar to them, we appear to be successful in transmitting some relevant environmental concepts.

The Scandinavian Folkehøgskole and Its Potential for Environmental Education

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Introduction

A thousand years ago, the Vikings sailed their dragon ships from Scandinavia east to the Volga River deep inside Russia, south to the Mediterranean and Black Sea, and west as far as the New World. In what was then the "civilized world", they were greatly feared, and the chronicles of recorded history have molded our image of the Norsemen as a violent people who raped, plundered, and pillaged the world (Jones, 1984).

As we are about to enter the 21st millennium, the descendants of these "violent tribes" are now viewed as a productive, peace loving people, who have attained one of the highest standards of living and literacy that the world has known. For many, the Scandinavian countries represent a political, social, and environmental utopia that exemplifies a healthy balance of socialism and democracy. It is refreshing to consider this living saga in light of the all too depressing social and environmental conditions that exist in the world today.

Rationale

For those of us involved in the field of environmental education, there seems to be little need to define or justify the need for integrating environmental awareness into the educational system. "Thinking globally, acting locally, and caring personally", and using ecological concepts as guidelines for curricula planning has become second nature. Yet this type of interdisciplinary teaching is still remarkably uncommon, especially at the college and university level where emphasis continues to be placed on isolated academic specialization. This seems to be especially true in more traditional European universities where very few interdisciplinary environmental studies programs exist. Most environmental programs offer highly specialized academic disciplines in ecology or environmental technology, but few offer programs that consider the relationships between ecology, history, philosophy, politics, and culture. While specialized programs are obviously needed to provide experts in the environmental field, it seems apparent that a large percentage of the educated citizens of the first world countries still remain largely ignorant or apathetic to the seriousness and complexity of environmental problems affecting our world.

The need for environmental education has been clearly articulated by UNESCO: "People who will have the greatest impact, for good or ill, are now with very few exceptions students at universities or other higher-education centers of learning. To impart to them the environmental knowledge and know-how for environmental care and improvement is literally a life or death matter for our one planet, the Earth" (Connect, 1991).

The Scandinavian Folkehøgskole system provides an exciting model in high education for interdisciplinary environmental education. It is a model that should be considered for other countries throughout the world.

Overview of the Folkehøgskole System

The Scandinavian Folkehøgskole (Folk High School) system was established by the Danish philosopher and priest, Nicolai Grundtvig in 1844. The folk academy is an educational forum for the common person and is a particularly Scandinavian phenomenon (Karlsrud, 1990). Christopher Bruun, a disciple of Grundtvig was responsible for introducing the folk academy to Norway. According to Bruun, "the education of the people should be concerned with the people themselves, and should be learned via history, language, myths, legends and poetry. Through education, the individual would be able to become part of a steadily growing society. The emphasis was to be placed on an education for life rather than examinations and a career" (Karlsrud, 1990).

To those experienced in the field of environmental education, the folkehøgskole represents an ideal opportunity for developing an exemplary interdisciplinary environmental education program that could serve as a model for educational programs throughout the world. Many of the programs offered at the folkehøgskole focus on areas that could readily be adapted to include an environmental perspective.

Olavskolen Folkehøgskole, where I taught, offered: pedagogy, theater, music, philosophy, media, cooking, and outdoor recreation. In addition, the programs could be philosophically connected by offering foundation courses and seminars in ecology and environmental issues that could complement the present focus on "culture, community, and solidarity", which would also support the mission of the folkehøgskole (Eriksen, Hoaas,1991). Classes could focus on basic ecological concepts as they relate to Scandinavian history, culture, and mythology, as well as contemporary bioregional and global issues. Students in the different areas of the curriculum could teach one another about the specific ways that their classes are addressing environmental perspectives. Experts involved in environmental issues could be used as guest instructors.

Environmental philosophy could be made more relevant by considering the evolution of attitudes and values toward nature in the Scandinavian culture and Western civilization as a whole. Classes could also consider the writings of Arne Naess, Peter Zapffe, and Sigmund Kvaloy and other Scandinavian authors who have written on various environmental perspectives. Naess, according to Roderigo Nash (1989), exerted the most impact on the new American environmentalism when he proposed "deep ecology". Deep Ecology, put simply and broadly, "is the belief that today's environmental problems are symptomatic of deeper problems in our society, and this belief requires an effort to solve these fundamental problems, not just retrofitting our current practices to be in line with environmentally correct mores" (Reed and Rothenberg, 1993). Students could benefit greatly from their exposure to environmental philosophy as it relates to complex cultural and environmental issues that effect Scandinavian society today with the knowledge that their homeland has historically produced some of the world's most articulate eco-philosophers.

Other Examples and Challenges

There are a few folkehøgskolen that have begun developing interdisciplinary environmental programs. The Naturhøjskolen Rodkilde in Denmark, for example, has been working for 10 years to integrate environmental education into their curriculum. According to their published material:

> Most of our activities are based on Man's relations with nature. We are all influenced by the fact that living conditions for plants, animals and human beings are being destroyed. This is why it is of utmost importance to meet with other people and exchange knowledge and experience so that we can preserve our ability to be curious, to be surprised and to wonder, to make visions and to act accordingly. We believe that people who have experienced all the beautiful and impressive aspects of Nature will do more to preserve it. At our school we combine concrete environmental activities and precise knowledge with poetry, art, humor and mutual understanding (Liengard, 1991).

Unfortunately, the folkehøgskole also faces some real challenges that influences the success of their programs, no matter what their focus.

Many schools receive students with emotional or drug related problems. Unemployment is causing the schools to become a home to the unemployed.

The programs do not give credit or examinations, so that learning is based on the motivation of the student. This is indicative of problems throughout the world. If young people have little hope for their own future, and are overwhelmed by negative environmental problems with no obvious solutions, they will have a difficult time responding to even the best planned curriculum.

On the positive side, the folkehøgskole is a microcosm of society in highly developed First World countries. If gains can be made, as I have seen at Olavskolen, I believe that the effort is not only worthwhile, it is essential. Basically it comes down to the question, if we cannot do it in First World countries, how can we expect to see change in Second and Third world countries?

Conclusion

The Scandinavian countries have an opportunity to have an influence on the social and environmental future of the world. Their cultures and global perspectives are highly respected internationally. As challenges and opportunities develop with the Baltic and other Eastern European countries, and the European community moves toward economic unification, the Scandinavian countries will be in a position to provide technical, political, and economic leadership. The Scandinavian countries and the folkehøgskole system could also provide an exciting and effective model for implementing environmental education and sharing this model with other countries throughout the world. This would be a fitting end to the Viking saga that began more than a millennium ago.

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Do Parents Learn From Their Children?

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Introduction

This study is part of a conservation program for one of the most endangered species of primates in the world, the black lion tamarin (Leontopithecus chrysopygus) (Valladares-Padua, 1992). For the last five years, environmental education programs have been to target at the populations surrounding natural areas where these primates are found (Padua, in press). The main goal of the education programs is the conservation of what is left of L. chrysopygus habitat, an extremely endangered Brazilian ecosystem, the Atlantic forest of the interior.

Located in Lençois Paulista, São Paulo State, the Rio Claro Farm is one of the six remaining forest fragments where these primates are found. The Farm belongs to a reforestation company (Duratex) which planted pines and eucalyptus connecting natural gallery forests along rivers and brooks. In these gallery forests a rich fauna has survived.

As a conservation strategy, the company encourages environmental education programs and research. Duratex supported this study for two purposes: 1) to assess the effectiveness of an education program among students; and 2) whether parents had cognitive or affective gains through their children's influence. This was important because only children were exposed to education activities in the Farm, and the need for adult oriented activities was apparent.

The Education Program and the Evaluation Procedures

The education program was designed for all students of the rural school inside the Rio Claro Farm and their parents who live and work at the Farm. However, only the children were directly exposed to the program.

To assess the effectiveness of the program, we used randomization in a pre-post control group experimental design which controls for most threats to internal validity (Campbell & Stanley, 1963) (Figure 1). Students from first to fourth grades were randomly assigned to a treatment or a control group. Parents followed the randomization assigned to their children, so they were also separated into the two groups. The only direct intervention with parents was the pre-test which consisted of a questionnaire answered on a Sunday afternoon at their homes.

On Monday we tested the children at their school, also through a questionnaire, and assigned them to their groups. While the treatment group was shown slides with information on the regional fauna and flora, the control group watched a film on how to plant a vegetable garden.

The following day, the treatment group went on a nature trail where they participated in education activities. The content reinforced ecological concepts that had been covered by the slide presentation. At the trail, however, learners had opportunities to directly experiment with the natural world. With the use of all their senses, students could develop skills which included observation, communication, use of imagination, ability to compare and contrast, problem solving and physical dexterity. They were also encouraged to answer and formulate questions as a means to stimulate curiosity.

On Wednesday all students answered a post-test. The parents' post-test was given on the second Sunday after the program was offered to their children. The purpose of this delay was to give the children time to work on their "take-home" exercise. This exercise was a poster with a text and no picture. The text comprised information on the black lion tamarin and means of protecting the species and its habitat. As a way to share the information they had received, the children were to draw the tamarin in its habitat with the help of their parents.

Due to the children's age (6 to 10), the test was conducted orally on a one by one basis. Parents also answered the tests orally because some were illiterate and we did not want to embarrass them. Only the children and parents present on both test occasions were included in the evaluation procedure.

Tests consisted of questions which measured knowledge and attitudes. The children's test had 20 questions while the parents' test had 17. Answers were evaluated according to pre-established categories so values could be assigned to each question. The maximum a child could score was 87 and the minimum 20. Parents could score the maximum of 75 and the minimum of 17.

Test scores were statistically analyzed using a Statistical Analysis System.

For ethical reasons, when the evaluation was complete we gave the control group the same education program the treatment group had received. Their curiosity had been aroused and it did not seem fair to have omitted them from the program.

Results and Discussion

As was expected because of the use of random selection, pre-tests for children and parents did not show significant differences between treatment and control groups (Table 1). The mean post-test score of the children's treatment group was significantly higher than those of the control group, which indicate that the education program was effective. The parents' mean post-test score, however, was higher than that of the pre-test, but not large enough to be labeled statistically different.

Control groups of both children and parents scored higher on the post-test, which may be explained by the interaction between groups. Figure 2 shows that the children's treatment group scored as high as the parents highest scores. Parents scored high on the pre-test so even with differences between pre- and post-tests, gains were not large enough to be statistically significant. Parents' prior knowledge may derive from their living in the Farm and being exposed to the region's natural environment. Other factors may have influenced the lack of significance on the parents' results. Some children may have been too young (18 children were 6 or 7 years old) to transfer information verbally. Additionally, a "take-home" exercise may not have been an appropriate activity for information transferal. Most parents work and children may not have had a chance to share their knowledge and experience.

The results of this study indicate that there was a small children/adult information transfer, although the possibility of increasing this effect may be sought through research on the matter. The importance of further research lies in the fact that most programs in developing countries are targeted at children who may not have the chance to make changes due to the accelerated rates of environmental depletion (Wood & Wood, 1987). Few education programs are designed for adults and there seems to be an underlying assumption that by reaching children, parents are automatically influenced. This study confirms Sutherland and Ham's (1992) findings that child-to-parent transfer of environmental ideology is small and cannot be a substitute for adult-targeted programs.

Our urgency to adopt effective strategies to reach other audiences through students is based on the wish to confront environmental problems as educators. Despite their invaluable contributions on empowering and stimulating children to become environmentally aware and participants of change, Hungerford & Volk (1990) admit that problems "enormously outweigh the successes in changing environmentally related behavior around the world" (p. 15). Students may become the vehicles to reach broader audiences, but we must know more so we can adopt more effective strategies to achieve this goal.

Acknowledgments

We thank the Duratex company and the children, parents and teachers who took part of this study. We are grateful to Lou Ann Dietz for reviewing this manuscript. Finally, we thank the Fanwood Foundation for their continuous support.

TABLE 1. Pre-test and Post-test Results for Children and Parents.

		Pre-Test			**Post-test**		
Children's	N	Mean	SD	T-test of diff.	Mean	SD	T-test of diff.
Treatment	21	57.06	13.6		61.25	13.2	
				0.78			2.63*
Control	16	60.38	12.1		71.85	11.2	

		Pre-test			**Post-test**		
Parents'	N	Mean	SD	T-test of diff.	Mean	SD	T-test of diff.
Treatment	15	65.86	6.4		71.4	2.38	
				0.19			1.45
Control	10	65.20	10.4		69.6	3.80	

* statistically significant at the .01 level

FIGURE 1. Visual representation of the experimental design used in this study
T = Treatment or environmental education program

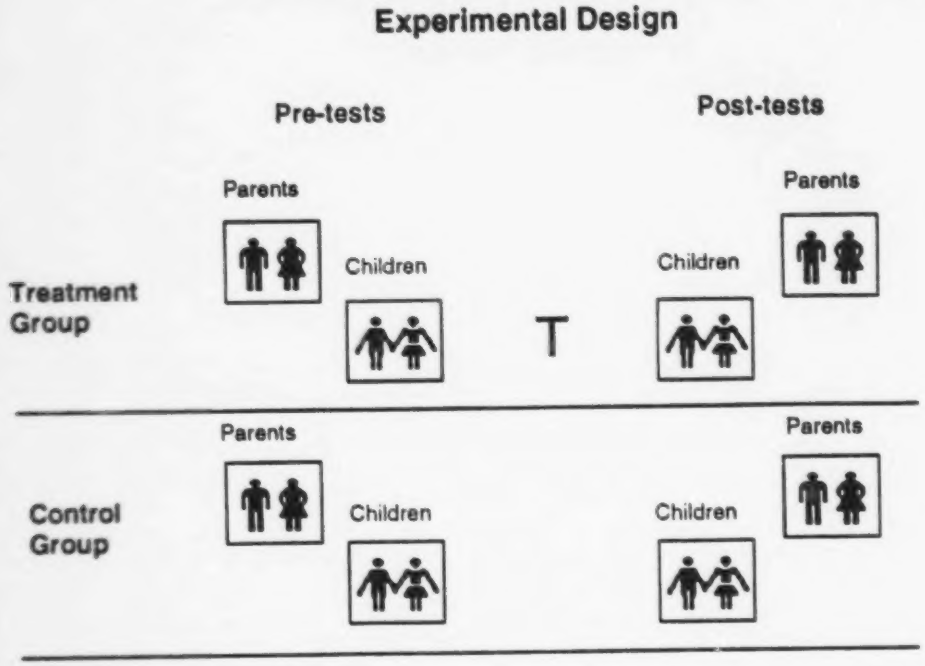
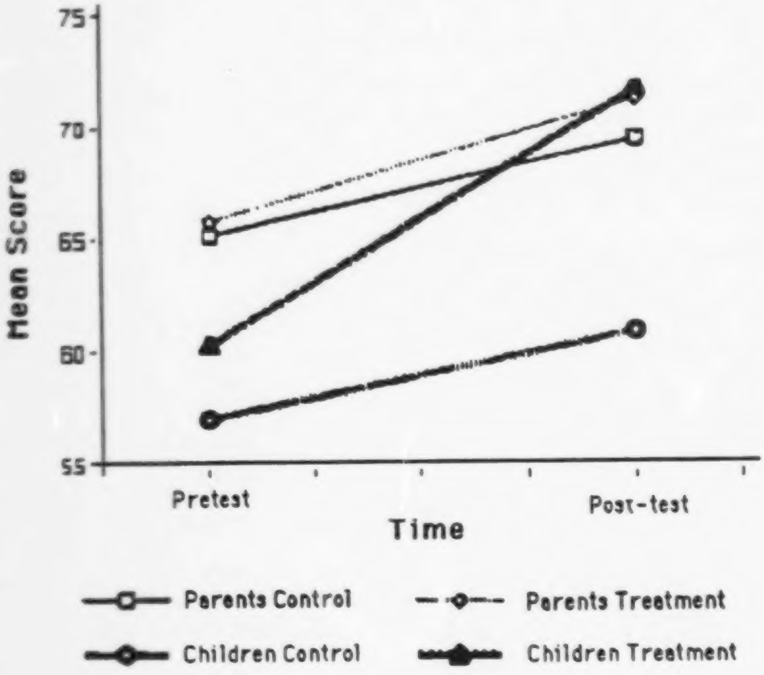

Experimental Design
Pre-tests
Post-tests
Parents
Children
Treatment Group
T
Children
Parents
Parents
Children
Control Group
Children
Parents

FIGURE 2: Mean scores of the Children's and Parents' Treatment and Control groups on the pre-test and post-test.



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Roots and Shoots—A Global Environmental Education Initiative

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Federal Republic of Germany

"Roots and Shoots" was founded in 1991 in Dar es Salaam, Tanzania during the Gombe 30 Wildlife Week, a celebration of 30 years of continuous chimpanzee research at Gombe Stream National Park. Currently, over 1500 students are involved in "Roots and Shoots" activities in 28 schools in Tanzania and on the island of Zanzibar. Further, "Roots and Shoots" has spread to other African nations as well as to the United States, Canada, Japan, the United Kingdom, China, Australia, New Zealand, and several countries in Europe.

The philosophy of "Roots and Shoots" focuses on youth and the individual. Children are the fertile ground in which seeds are planted. Once these seeds germinate, their roots spread out in all directions and establish a firm foundation. Their shoots, the further development of these young individuals, are strong and are capable of moving great obstacles in their upward growth toward light. Within this concept it is emphasized that every individual is important, has a role to play, and that each individual can make a difference.

The aim of "Roots and Shoots" is to empower individuals to learn through awareness, action, and reflective analysis. Further, the program strives to support local, regional, and global conservation endeavors. "Roots and Shoots" is truly an international program aspiring to unite young people from different cultural backgrounds in common causes. Through their efforts, children will grow to understand and care for the interdependence of all life on earth.

Organizationally, "Roots and Shoots" aims to have a headquarters in each country. This will either be a Jane Goodall Institute (JGI) office or a person designated by Dr. Goodall herself. The headquarters will function to link representatives to regional and city offices via a computer network. The first structured pilot project on a national level will begin in fall 1993 in Poland in conjunction with the National Center for Environmental Education in Warsaw. A national "Roots and Shoots" youth summit, sponsored by the Jane Goodall Institute, the Albert Schweitzer Institute for the Humanities, and Quinnipiac College, has been organized for October 8-11, 1993 in Hamden, Connecticut.

Some educational support materials are available for "Roots and Shoots" facilitators. Among the planned and available resources are videos, illustrated activity and stimulus sheets, communiqués with "Roots and Shoots" groups worldwide, and a quarterly newsletter. These materials, intended for young people of all ages, are cross-curriculum in their approach and are structured to complement existing teaching requirements. Furthermore, these resources will be available in all major world languages as well as several African languages.

Promoting Respect for All Forms of Life—A Model Primary Education Program in Costa Rica

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Introduction

The WSPA Costa Rican Humane Education Project[1] represents the first successful effort in the world to integrate a humane/environmental education curriculum directly into the public school system of a developing nation. Since its inception in 1989, the project has been enthusiastically supported by the President of Costa Rica and the Ministry of Public Education, and has been embraced by Costa Rican teachers, students and parents. Its resounding early success has clearly illustrated the feasibility of working directly with a nation's school system to promote children's respect for all forms of life and the environment.

Educational Principles

The main objective of this project is to shape children's positive attitudes toward animals and the environment, as well as toward other children. The goal is not only to teach children the facts they need to know in order to act more responsibly in their treatment of animals, the environment and fellow children, but also to develop in them positive attitudes so that they treat all forms of life and the environment with compassion and respect.

Activity Based Curriculum

This focus on molding attitudes among youngsters implies the application of an activity-based pedagogy. Children can absorb facts by listening and reading, but they will develop positive attitudes toward animals through active learning, such as observation, role playing and lively discussion. The curriculum consists of dozens of activities in each grade. For example, in grade 1 children are asked to draw all the animals that live in or around a tree stump. To complete this activity children go outside and observe the variety of living creatures on a log, trunk or stump. Children are encouraged to examine the wood closely, perhaps discovering for the first time the teeming life in a microcosm such as a tree stump. The activity also shows children how different animals and plants depend on each other for life, a concept that is developed more fully in higher grades.

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[1] The project has been made possible by sustained support of the World Society for the Protection of Animals (WSPA); by generous contributions from the Royal Society for the Protection of Animals, the Oliver S. and Jennie R. Donaldson Charitable Trust, the Humane Society of the United States; and by the cooperation and support of the Costa Rican Ministry of Public Education.

As the children get older they are able to begin dealing with more abstract conceptual issues, and the materials take advantage of this by introducing topics such as sustainable development, the interrelationship of all life, and the disruption of ecosystems. In the 6th and final year of the curriculum, children participate in activities that compare the extremely long history of life on Earth to the very short period of environmental degradation caused by human activity. They use these activities to develop an understanding of the complex interactions between people and their environment both locally and globally, to reflect on the effects of human actions on animals and the environment, and to perceive the need for sustainable economic practices in order to assure the continued existence of human civilization.

Involving Teachers

The activity-based approach to learning makes on-going teacher training essential. In this project, the teacher not only imparts knowledge, but stimulates discussion and encourages children to explore their beliefs about the proper care and respect of animals and their habitats through activities that engage them affectively as well as cognitively. The teachers also become role models. It is not enough for them to simply instruct children in the proper care of animals, or to tell students it is important to respect the environment. Children need to have concrete, practical experiences that help them develop caring attitudes with teachers' regular guidance and leadership.

Multidisciplinary Activities

Another basic principle that has been taken into account in the design of this project is the multi-disciplinary nature of the curriculum. Humane/environmental education is not a school subject by itself, but is integrated in activities across the primary school curriculum. Positive attitudes toward animals and their habitats can be promoted by activities that involve science, reading, writing, social studies, mathematics and art. Each activity is linked to one or more learning objectives of the official Costa Rican public school curriculum, so teachers fulfill their curricular requirements as they conduct activities from the project materials.

Brief Project History

The WSPA Costa Rican Humane Education Project was initiated in 1989. The first year was dedicated to the development of teacher and student materials for grades 1 to 3, based on exemplary humane and environmental education materials obtained from around the world, and adapted to the language, cultural, ecological and educational realities of Costa Rica. The second year of the project was devoted to classroom testing of the materials in a small number of schools, and to training a core of dedicated and enthusiastic teachers.

The 1991 school year saw involvement of some 2,500 students in the project throughout Costa Rica, continuing teacher support in the form of regional training workshops, the development of grade 4 Humane/Environmental Education curriculum materials for use in 1992, and a controlled evaluation to assess the extent to which the project engenders humane attitudes among participating children.

In 1992 the project expanded to more than 250 classrooms and 12,000 children in grades 1-4 across Costa Rica. In order to orient new teachers and provide ongoing training and support throughout the year in the use of the materials, a group of 8 lead teachers was specially trained by the Ministry of Education and WSPA. This group of exemplary educators was selected in order to impart their enthusiasm and experience to new teachers. Each lead teacher worked with some 30 beginning teachers, meeting locally at least four times per year. This teacher training component has been an essential part of the project, because only when teachers internalize the concepts and values promoted by the curriculum are they effective in imparting those values to their students.

In 1992 the grade 4 materials were field tested in a small number of classrooms and the first version of the grade 5 materials was developed. In 1993 the grade 5 materials were field tested and the grade 6 materials were developed and readied for field testing in 1994. Beginning in 1993, the responsibility for large scale printing of the materials was assumed by the Costa Rican Ministry of Public Education and sufficient materials were printed and disseminated to more than 20,000 children in grades 1-5.

Documenting Project Effectiveness

From the very first year, the project has enjoyed the enthusiastic support of teachers, students and parents as well as Ministry of Education officials. Many teachers have claimed that the project activities have a marked effect on their children's interest, attitudes and behavior. A key indicator of project popularity has been the overwhelming demand for project participation by teachers. In 1992 and 1993 there was a waiting list of more than 200 teachers who desired to participate in the project, but who were not able to do so due to limitations on availability of materials and teacher training.

A controlled evaluation was conducted in 1991 to assess to what extent children's participation in the project significantly enhances the humanness of their responses in a variety of situations involving people, animals and the environment. A representative sample of 194 participating students and 130 control students in grades 1-3 responded to a set of humane/environmental scales. Students took the same tests again in October 1991, after a full year of using the project materials and again in March 1992, after a three-month vacation. A second control group was added to test for the potential effects of multiple retesting.

The results of the evaluation were most encouraging, demonstrating clearly that participation in the project had a statistically significant and sustained positive effect on children's humane attitudes. Not only did children in the treatment group score significantly higher on the post-test than children who did not participate in the project, but this difference was evident even on the delayed post-test. There was no significant difference in the scores of the two control groups. The results are summarized in Figure 9.

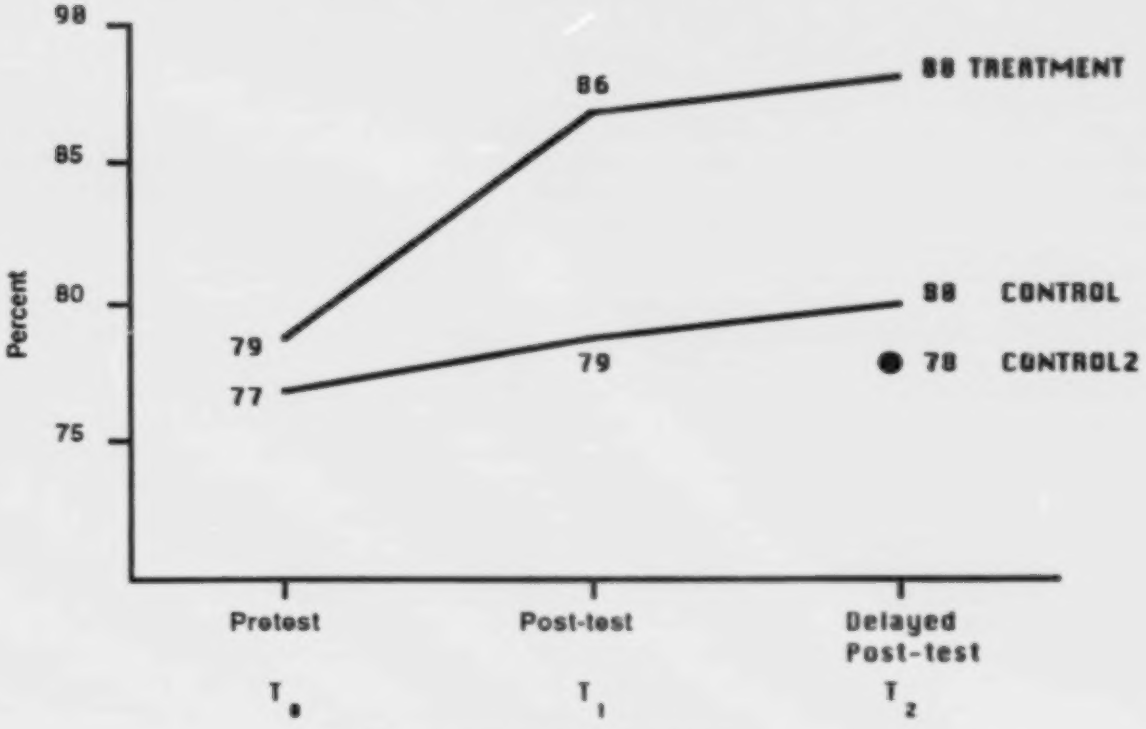
The positive results of the controlled evaluation are particularly noteworthy considering that all teachers participating in the study were using the materials for the first time. For this project to register a significant measurable impact in its first year of implementation implies that its benefits are likely to expand as it becomes more institutionalized in the coming years.

Conclusion

In times of environmental degradation, animal neglect and child abuse, it is gratifying to show the positive effects of an educational project on the attitudes of young children. Only time will tell whether the children who have participated in this project will grow to become adults who respect and care for their environment and who teach their children to respect all forms of life. However, the WSPA Costa Rica Humane Education Project has already established itself as a model for what can be accomplished in the context of a public education system in the developing world.

The goals for 1994 are to continue the expansion of the project in Costa Rica to include 30,000 children, and to build on the success and experience of the Costa Rican Project by establishing humane/environmental education sites in other Latin American countries. Ministry of Education personnel in several nations have expressed an interest in hosting the project, and decisions about where to initiate replication sites are imminent.

FIGURE 9: PRETEST, POST-TEST AND DELAYED POST TEST RESULTS OF HUMANE ATTITUDE SCALE ADMINISTERED IN MARCH 1991, OCTOBER 1991 AND MARCH 1992.



HUMANE ATTITUDE SCALE

At T1, difference between Treatment and Control Group is 7% ($F=6.3$, $p<.01$)

At T2, difference between Treatment and Contol Group is 8% ($F=7.6$, $p<.01$)

No significant difference at T0, or between two control groups at T2.

Los Arboles Hablan—Developing Spanish Language Skills Through a Study of Latin American Forests

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Introduction

Los Arboles Hablan is a video-based curriculum unit that promotes the learning of Spanish as a foreign language through the study of Latin American forests. The project, sponsored by the U.S. Department of Education International Research and Studies Program, consists of a video and accompanying instructional materials for middle school students in grades 7-9, integrating science, social studies and environmental education while teaching the Spanish language. The content specifically focuses on the Amazon rain forest, the virgin forests of Chile and Costa Rica's cloud forest.

The approach to the development of the instructional materials has been grounded in INCRE's belief that language and culture are inseparable and that students are more open to acquiring foreign language skills and to improving existing skills if they develop an interest in the subject matter on which language learning is based. The project focuses on the conservation of forests and provides an opportunity to introduce American students to an environmental issue that is critical to Latin America and to the world. *Los Arboles Hablan* offers teachers and students a valuable opportunity to engage in Spanish language learning geared to a wide spectrum of learning styles. In addition, these materials promote respect for Latin American culture, and encourage concern for the preservation of our environment and its inhabitants.

The videotape and printed components of the curriculum unit have been designed to be used in an integrated manner in the Spanish language learning classroom. The curriculum is divided into twelve segments, with activities in each segment designed to take up one or two class periods. If used daily, the curriculum unit takes approximately three weeks to complete, with the possibility of spending at least one or two additional weeks on suggested follow-up and integrative activities.

Project Materials

In the videotape, students are introduced to Teresa and Ricardo, two Hispanic-American teenagers who are their guides throughout the video. Each curriculum day, the students view six to eight minutes of video, watching the adventures of Teresa and Ricardo as they become intrigued by and concerned for the rain forests of Latin America. Content and language learning are offered in an engaging format as Teresa and Ricardo receive letters and calls from relatives in Latin America, and eventually go on their own expeditions to the forests. Extensive footage from rain forests of Chile, Brazil, and Costa Rica has been used throughout the video production to offer students the opportunity to see the beauty of the forests and its inhabitants, as well as to witness the effects of deforestation.

The video shows Teresa and Ricardo as they become interested in studying the Amazon rain forest through a science project. After some research, which includes watching a television program about forests and a video on the Amazon rain forest, they prepare for a trip to the tropical rain forest. Students see Teresa pack for her trip to Brazil, and watch as Ricardo and Teresa obtain flight information from a travel agent. Finally, they take a trip to the Amazon, where they see the beauty and immenseness of the forest, the plants and animals of the forest and the indigenous people who call the rain forest their home. They also witness the destruction of forest by logging and burning.

Some time after her return from Brazil, Teresa receives a letter from her sister in Costa Rica, inviting her and Ricardo to visit the Costa Rican cloud forest, which is a lush tropical rain forest that only grows on a few mountain peaks in Central America. The two teenagers set off again, this time to visit the cloud forest, with its rich plant life and many eco-tourists.

By this time, Teresa and Ricardo have learned a great deal about tropical rain forests. Teresa's aunt, who lives in Chile, learns of their interest in forests and calls to invite them on an expedition to the temperate rain forest in the south of Chile, where some of the oldest and tallest trees in the world grow. Teresa and Ricardo join the expedition, completing their study of the Latin American rain forests.

An accompanying Teachers Guide provides: 1) the rationale for the development of the materials; 2) a description of the organization of the curriculum; 3) directions for duplication of the student materials; 4) suggestions for integration with other subject area teachers; 5) a discussion of utilizing the video dialogues to promote language learning; 6) a fully classroom-tested set of student evaluation instruments and suggestions for grading; 7) detailed day-by-day lesson plans, teaching tips and background information for each lesson; and 8) a complete set of student materials with answers.

Field Testing and Evaluation

The *Los Arboles Hablan* materials have been classroom tested and evaluated in 17 middle school Spanish I and Spanish II classes in the spring of 1993. The two goals of the field testing and evaluation were: 1) to obtain feedback from teachers, students and classroom observers that would be useful in improving the content and organization of the curriculum unit; and 2) to assess the extent to which the curriculum unit engaged student interest and promoted learning of Spanish and content related to Latin American forests.

All data indicate that the curriculum unit was very well received and achieved defined learning objectives. Student and teacher reaction was overwhelmingly positive, and results of pre-post testing showed large gains in Spanish language skills and in content knowledge related to Latin American geography and rain forests. This section presents the results obtained from the various data collection instruments.

Test Results

The test results showed consistent and highly significant gains in all sections of the test. The composite score on the written test increased from a mean of 65.4 on the pre-test to a mean of 81.8 on the post test, a mean gain of 16.4 points, or 25.1%. There were no significant differences in the pre-test scores between students in Spanish I and Spanish II. The average gain of Spanish I students was actually somewhat higher than the average gain of Spanish II students: Spanish I students increased their scores by an average of 18.2 points, while Spanish II students increased their scores by an average of 15.5 points.

Student Feedback

A total of 319 students at the field test sites completed the feedback form. 50% said that they enjoyed the *Los Arboles Hablan* curriculum "a lot" or "quite a bit", and only 13% said they enjoyed the curriculum "a little" or "not at all". 70% thought that the curriculum unit was more interesting than their regular Spanish class, and only 8% thought that the unit was less interesting than their regular class. 87% thought that the curriculum unit should be used in Spanish class again next year.

The most popular activity by far was watching the videos, which was cited by 66% of students as the activity they most enjoyed. Other popular activities listed by students included (in order of popularity) the final poster project, working in groups, learning about rain forests, the crossword puzzle, the dialogues, the worksheets, and calling the travel agency.

Teacher Feedback

All 6 teachers who field tested *Los Arboles Hablan* were unanimous in their praise of the curriculum unit. On the feedback form, all six said that their students enjoyed the curriculum unit "A lot", and all six also concurred that they enjoyed teaching the unit "A lot". All six also said that they are planning to use the curriculum unit again next year. All teachers concurred that students learned "A lot" of Spanish in this unit, and also learned "A lot" about Latin American forests.

Classroom Observations

The extensive classroom observation by INCRE evaluators included the following results:

- Students were engaged and on-task throughout the unit. The videos served to generate a lot of student interest which translated to rich discussions and attention to classwork and homework.
- The extensive cooperative learning activities in pairs and small groups were integrated very well into the flow of the unit. There was no time lost to classroom mechanics or disruptive behavior.
- The teacher's guide provided sufficient materials and guidance for teachers, none of whom needed additional support at any time during the field tests. Teachers felt that the materials and lessons provided in the teacher's guide were fully adequate.
- Students were very motivated by the final poster project. Students are asked to make a fully bilingual poster showing one type of Latin American rain forest. Their interest in the theme was evident in the products, which were displayed in school corridors and generated many positive comments from school administrators and teachers.

Conclusions

The main conclusion is that the curriculum unit *Los Arboles Hablan* has proved to be very popular with teachers and students alike, and has been shown to be effective in promoting Spanish language skills and knowledge of geography, science and environmental content related to the rain forests of Latin America. The success of the unit demonstrates that video can effectively be used as an integral component of instruction, and that an interdisciplinary curriculum can be effective in promoting language learning while teaching substantive content knowledge.

STRAND V : FROM RESEARCH TO APPLICATION IN EE

From Research to Application--Using an Environmental Monitor to Capture Data

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The LABWORKS interface system is used as an environmental field monitor to save time, provide better results than kit methods, and encourage the thought-intensive processes of science.

The goals of environmental education should be to develop higher order thinking skills through a hands-on approach to: 1) the understanding of Earth Systems and their independence; 2) the understanding of the scientific principles that govern the behavior of these systems; and 3) the understanding of how these systems are managed.

Gaining a view of Earth Systems is an integrated approach requiring simulation, laboratory and field data collection, data analysis, scientific and real-world applications, and modeling of collected data.

Awareness

The Energy and Environmental Simulator can be a useful tool to introduce Earth Systems concepts and to identify the scientific principles that govern their interdependence. This computer software models energy and water systems (reservoirs, dams, irrigation, power generation, rivers, precipitation, annual runoff, etc.) and allows the user to manipulate the governing factors.

Analysis

The LABWORKS interface system coupled to a PC or MAC computer is a tool for investigating environmental variables in the laboratory.

LABWORKS measures:

Temperature
pH
Light intensity
Dissolved oxygen
Turbidity
Time
Colorimetry
Phosphate
Nitrate
Others
Conductivity/TDS
Barometric pressure

The LABWORKS software provides a canned experiment package and the ability to customize experiments or to write your own experiments using its menu-driven experiment build/edit software. The software provides ease of data collection and data logging, all with high resolution and ease of operation.

Synthesis

Scientific principles can be explored in the field using the LABWORKS interface connected to a laptop computer. Up to four types of data can be collected simultaneously, ex-light, temperature, pH, and time. Environmental assessment of all types can be investigated using the LABWORKS system as an environmental monitor. For example, it is difficult to measure low levels of orthophosphate or nitrate in water if the samples have to be brought back to the laboratory for analysis or measured in the field by standard kit methods. Using LABWORKS and a laptop computer coupled to the colorimeter, it is possible to make more accurate field measurements of these parameters than can be accomplished using only kit methods. However, use of the prepackaged kit chemicals can make this colorimetric method more convenient, while not reducing the accuracy of the LABWORKS colorimetric method.

Scientific Application

Because less time is required for data collection, students can spend more time in the thought-intensive aspects of science. LABWORKS provides the tools for analyzing data. LABWORKS graphing and mathematical analysis software makes it easy to solve problems by integrating scientific principles and experimental data. Data are collected into the spreadsheet portion of the software and easily graphed. Data are easily organized and analyzed using the mathematical analysis portion of the spreadsheet/graphing software to find generalizations.

Real World Application

The Energy and Environmental Simulator is used to illustrate and model real world application of scientific principles and regional data to develop natural resource management strategies. Students are encouraged to identify a research problem, design a research plan, and collect data, synthesize and analyze data, draw conclusions, and apply their findings to the management of their problem through work with the responsible entities and resource personnel.

Contact SCI TECH, which produces the LABWORKS interface, for more information phone (406) 585-9088.

Getting Started--Using Story to Encourage Teachers to Try Environmental Education in Their Classrooms

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For many, the prospect of incorporating environmental education into the classroom is a bit daunting--teachers may not know how to start, what to expect, or where to find information. Might stories about what others have done help teachers bridge this gap between good intentions and actions? This paper describes an ongoing research process by the National Consortium for Environmental Education and Training (NCEET) to explore that question.

Development of an Opportunity: Getting Started

A collaboration with the National Environmental Education and Training Foundation on an environmental education directory provided us the opportunity to use story as a way to reach out to teachers new to environmental education (EE). Initially, the directory was to include a listing of EE resources, information on acquiring curricular materials and training, and strategies for working within one's school, community, or state to do environmental education.

Based on earlier work (Bardwell, 1991; Monroe, 1991), we argued that stories would effectively inform readers about the challenges of teaching about the environment than explanatory text. Teachers need resources, but also some sense of the kind of "terrain" they are entering. Including stories of teachers who have brought environmental education into their classrooms might offer that contextual richness. These stories would focus on HOW--how these teachers got started, what resources they needed, their strategies and some of the pitfalls they encountered. Furthermore, featuring real people would be a way to acknowledge these teachers' exemplary efforts, and to introduce them as resources willing to work with other teachers.

Why Stories?

Most people find stories more interesting than traditional expository text. We also know that interesting text contributes to people's ability to recall, comprehend and apply concepts from one setting to another (Hidi and Baird, 1988; Monroe, 1991). As such, stories could be a potentially powerful tool in helping learners--students, teachers, anyone--translate their concern and interest into action (Bardwell, 1991).

In the context of *Getting Started*, stories presented an engaging way to demystify the novice teacher's first steps to do EE, answer some concerns, or outline an exciting idea. By including many profiles, *Getting Started* could present a wide array of efforts and circumstances. In that way, we hoped to provide something that would pique each reader's interest, and that would help him/her build an image of what was possible.

Development of the Stories

Teachers recommended by trainers, education coordinators, and environmental educators were interviewed on the phone. Professional writers then fashioned each account into a story. Converting interviews into stories meant incorporating elements that make a story a story: a storyline, character development, uncertainty, humor, and action. Each teacher reviewed their story before publication.

What's in a Story?

Our conviction that stories about teachers can encourage others to incorporate environmental education into their classrooms is theoretical. Our research effort is in several steps; the results of Phase 1 are described below.

Phase 1: What about a Story Works?

This phase focused on what kinds of stories and information are more interesting and useful to teachers. We pilot tested 2 sets of 5 profiles or stories with 14 elementary and middle school teachers. Each set included a range of profiles varying by grade level, school setting, geographic location, and subject taught. Participants read each story and then rated it for how interesting, instructive, and informative it was, how much they liked the idea discussed in the story, and how likely they were to do something similar in their classrooms. They also rated the criteria they saw as most important for any profile to be useful.

The sample is too small for us to provide statistics, but the responses were illuminating:

1. Stories are capable of engaging teachers:

   The teachers found the stories informative and the ideas discussed there interesting. Those stories these teachers found least useful were more abstract and general, describing what someone did without specifics of "how." Teachers preferred stories that included specific information on content, curriculum and operational details and that described the impacts of the effort on the students (see example below).

2. Liking a story doesn't increase one's likelihood of actually doing it in class:

   Across the board, teachers indicated only a moderate inclination to actually use the idea presented in the story irrespective of how "good" they rated it.

3. Teachers assessments looked at how useful and doable the ideas were:

> One of our hypotheses had been that teachers would prefer stories about teachers like themselves--those teaching the same grade, using similar curricula, from similar places. These factors proved less important to teachers than that the story describe some new ideas and solutions with well written how-to descriptions.

In general the results reinforced what we have learned in our other pilot studies. As with curricula and other information, teachers want details and descriptive how-to's. Their lens seems to be "could I do this" or "is there enough here to tell me what would it take to do in my class." The most popular stories were the most concrete and pragmatic.

Phase II: Story Collection

These general findings guided the selection and adaptation of the 35 stories included in the final version of Getting Started. A draft version is currently under review. The final version will be included in NCEET's EE Toolbox and as a stand alone publication.

Phase III: Is it Working?

Our primary objective is to have a product that teachers find useful. It's all too easy to feel finished when the product is distributed. From our perspective, that's when another phase of our work begins. We will be systematically eliciting teachers' feedback and evaluation in order to assess whether or not this combination of story and resource information serves its purpose. We are currently developing assessment tools and hope to produce an ongoing resource improved by that feedback. Furthermore, we see Getting Started as the "raw material" for ongoing research on the use of stories, and as the beginnings of a database of information on successful efforts by teachers, administrators, librarians, and parents to incorporate environmental education into classrooms.

A Sample Story: Things That Aren't Supposed to Be There

Vicki Rich uses her school's five-acre grounds in Wooster, Ohio as an environmental classroom. Outside, she leads her third-grade students on a search for "things that aren't supposed to be there."

In the school's playing fields, parking lots and woods, they collect paper, plastic and other trash. One year, a student found a rusty, old wrench. Another group discovered a sharp chunk of metal jutting up from the ground. Working together to dig it up, students and teachers discovered it was an engine. The day after this treasure hunt, Vicki invites a community recycling program representative to discuss with her class the different between recyclable and non-recyclable materials.

Before sending away all those "things that aren't supposed to be there," Vicki leads an art project. The students use their found objects to build sculptures. "They're usually pretty abstract," says Vicki, but it does allow the students to compare milk jugs and trees, newspaper and leaves, metal and stone. Once appropriately admired by the other classes in the school, the artwork is dismantled and the objects divided into appropriate categories: natural objects go back to the woods, recyclables go to the recycling center. Trash is disposed of properly. The student who found the wrench managed to trade it in for a new one at the hardware store.

Vicki's hunt is just one of many environmental activities she leads during the school year. Years ago, she started small, adding environmental vocabulary words to her language arts lessons, and read environmental fables like Bill Peet's "The Wump World." One year, she asked students to write themes on the topic of 'How I See Today's World and How I Would Change It.' Going to the library, looking up organizations that offer environmental curricula and writing for information generated a wealth of materials. So much, she had no trouble creating a one-week, multidisciplinary unit. Now Vicki uses a variety of resources and weaves environmental themes throughout her curriculum.

Vicki's unit meets all of her school district's standards. She addresses the environment while meeting objectives in art, math, science, and language arts. Each year, she changes some elements, keeping activities that work particularly well. She has so much material and so many ideas, she says, that she could teach an entirely different unit each year. All it took to get started was an interest in going beyond the textbook.

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A Research Project on Mammal Populations

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Introduction

Beechwood Farms Nature Reserve, operated by the Audubon Society of Western Pennsylvania, in cooperation with The Section of Mammals of The Carnegie has created a program designed specifically for 7th & 8th grade students entitled "Counting Critters: Research on Small Mammal Populations." Funding for start up costs and an initial pilot project were provided from a grant from Pittsburgh National Corporation Charitable Trusts. The program was created to address this age group's lack of participation in Beechwood's Outdoor Discovery Programs. Of the 5,000 school students who participate annually in Beechwood's school programming, less than 5% were from this age group. We were clearly missing an opportunity to provide them with a field experience which would extend classroom learning, generate an enthusiasm for the natural world and enhance knowledge of environmental concepts. We also recognized the importance of this age for developing positive attitudes toward the sciences and interest in potential career opportunities. Yet, the field experience should be dynamic and fun to keep the interest level of this challenging age group. Finally, student participation in a research project whereby they were contributing new data could provide a sense of significant accomplishment.

Objectives

The program was designed in accordance with the following objectives:

1. To provide a field experience for 7th & 8th grade students, based on a hands-on approach, which would generate strong interest in life sciences, scientific study and the local small mammal population.
2. To afford students the opportunity to participate in and contribute to the gathering of data and its mathematical analysis for ongoing research of small mammal populations.

3. To emphasize cooperative learning and critical thinking skills in addition to scientific skills.

4. To illustrate how different disciplines are related to the understanding of science.

Participants

Five schools were contacted, four of which agreed to participate in the day-long (9:30 am-2:00 p.m.) program. As we could only accommodate 50 students at a time, only selected sections of each participating grade could take part. Teachers had to agree to conduct pre-trip activities which required approximately two class sessions. The pre-trip packet, sent to the teacher's six weeks prior to the scheduled field trip, contained program objectives, vocabulary, background information on population sampling, and three in-class activities with accompanying data sheets. These activities were specifically designed to familiarize students with not only the mammals likely to be captured but also the population estimation techniques they would be using. A letter to students which explained the research project and their importance to it was also included.

Professional Staff

The project was coordinated by Beechwood's Environmental Education Coordinator with assistance from a Post-doctoral Fellow at The Carnegie's Section of Mammals. Additional help and training was provided by Dr. Joe Merritt, a mammologist and field researcher at Powdermill Nature Reserve. Dr. Merritt has been live-trapping small mammals on a grid in the Laurel Ridge for a number of years.

Beechwood's pool of trained Volunteer Naturalists, who are integral to the success of all school programming, were solicited to help with the field trip. Three were selected and trained.

Set Up

Prior to implementation of the program, an annual permit for live-trapping was applied for and received from the PA State Game Commission. Because we deal with the general public and in light of the controversies surrounding humane treatment of research animals, the Audubon Society of Western PA, in consultation with a veterinarian and several wildlife biologists, established a policy on live-trapping small mammals.

Two 40 by 50 meter grids were established with flagged trap locations at 5 meter intervals on one axis and 10 meter intervals on the other. Fifty-five Sherman live traps were placed on each grid. One grid was located in a second growth deciduous forest and the second in an old farm field.

The woodland traps were baited with sunflower seeds the evening preceding the scheduled field trips. Prior trapping and tagging showed that *Peromyscus leucopus* was the most likely species to be captured and the most easily tagged. Other species, *Tamias striatus* (difficult to handle much less eartag) and *Blarina brevicauda* (minimal earlobes to eartag) would be censused only. To date these are the only species of small mammals captured on the woodland grid.

The field traps were baited in the mornings prior to the arrival of the students with sliced apple to attract *Microtus pennsylvanicus*. Because this species has such small pinnae, they were marked with "White Out".

Field Trip Descriptions

After an initial introduction which reviewed the project and procedures as well as familiarizing the students with Beechwood, each group of fifty students was divided into five groups of ten and assigned a leader. Within each group, individuals were assigned specific tasks to perform when checking the traps on the two grids.

They learned to bait and set traps. They checked assigned traps on each grid and recorded pertinent information about those critters captured: species, weight, sex, reproductive status, and general condition. They also recorded data on the specific field sites such as weather conditions and vegetation. Students also observed ear-tagging procedures.

The opportunity for students to make practical application of many of the skills learned in other school classes was emphasized throughout the day. Math, writing and science skills were integrated into the activities of this field experience. After a morning spent in the field, which generated a high level of excitement and not only encouraged deeper respect for wildlife but also piqued their interest in scientific study, students were divided into two groups. They used the data collected to estimate populations based on the recapture method utilizing their knowledge of algebraic equations. Computation skills were put to use when projecting populations of larger areas based on data from the woodland and field grids. Graphing skills came into play when comparing numbers of individual species and when plotting home ranges.

As a final wrap-up to the day, a professional wildlife biologist spoke briefly to them, discussing the importance of the data they had collected and its relevance as well as touching on career opportunities in the field.

Field Trip Schedule

F9:45-10:15	Introduction: Familiarize with Beechwood and schedule for the day; review small mammals with slides and study skins: demonstrate proper use of equipment: traps; ear tags; spring scales for weighing; Explain data sheets.
10:15-10:30	Assign small groups to leaders. Leaders describe and hand out field tasks to individuals.
10:30-12:00	Check assigned locations on each grid and record appropriate data under leader's direction.
12:00-12:30	Lunch
12:30-1:30	Divide into two groups for analysis of data; estimate populations using recapture activity sheets. Work on home range data.
1:30-2:00	Wildlife Biologist speaks & wrap-up

Conclusions

Written evaluations from participating teachers were overwhelmingly positive. They felt that the pre-trip, in-class activities provided a good foundation for the work done on the field trip and that the hands-on experience with the small mammals was an outstanding aspect of the program. Teachers also liked that students were given tasks, kept on task, and expected to succeed. Student reactions, although not formally evaluated, were also favorable. One complaint, over which we had no control, was the small number of mammals trapped (5 to 10 per grid). After checking the grid for mammal locations, trap locations were assigned to ensure that each group had the opportunity to work with the mammals. Based on our findings since last Spring, we don't anticipate this problem in the Fall as population sizes have naturally increased over the summer.

We worked with 7th, 8th and 9th grade students in these pilot projects. Staff and Volunteer Naturalists felt that it was most suited to 7th grade students. They had the maturity to accomplish assigned tasks, the knowledge to understand the math applications and, most of all, an openness to the awe and excitement of the field experience not found in older students.

We did encounter problems with the field grid as a result of so many students walking through it to check the traps. By the third day, we were trapping many fewer *Microtus pennsylvanicus*. We think that this was because their runways, tunneled in the grasses, were being trampled. In the future, we will establish transect lines at different locations throughout the nature reserve's fields.

One of the program's drawbacks is its inability to accommodate an entire grade. Most middle schools in our area have between 150 and 200 students. Our program can only handle 50. Therefore, we are looking into packaging the program for teachers to use on their own school grounds where possible. We are also investigating computer applications for use during the field trip and back in the classroom.

Based on the initial success of the programs, we are continuing to pilot the program with three additional 7th grade classes in the Fall of 1993. In the Spring of 1994 the program will be incorporated into our Outdoor Discovery Program offerings for 7th & 8th grade students on a limited basis.

Environmental Education From Awareness to Action--A Report of an Inservice Program in Alabama

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Introduction

Nineteen educators from Northeast Alabama were beginning to write interdisciplinary environmental education learning activities following a week of educational experiences together. Someone said, "How can we keep our unity together when we are in isolation?"

"You mean among us?" asked another.
"Uh-huh."
"It's the feeling," said yet another voice.
(Laughter)
"How about establishing a Northeast Alabama Environmental Educators Network?" someone asked.
(Rousing applause with cheers) "Yes, Yes, Yes."

With that, a new grassroots network of teachers of science, mathematics, industrial arts, and English was launched. What led to this spontaneous coalescing of persons who had scarcely known one another the week before into a community dedicated to supporting one another in environmental education? For tentative answers to that question, we turned to the reflective journals that members of the *Environmental Science: From Awareness to Action* project had written during their 10-day course in June 1993.

Description of the Data

The project was sponsored by the Dwight D. Eisenhower Mathematics and Science Education Program through the Alabama Commission on Higher Education. Participants went through a series of planned activities to enhance their knowledge and awareness of environmental protection issues and stimulate the incorporation of environmental awareness and action into classroom learning. The project offered participants graduate credit in biology, interdisciplinary science, or education. Continuing education credit was also available.

Each day the program activities began with interactive environmental education experiences adapted from Project WILD and other sources. At the end of each day participants shared (and we recorded) statements about what they had learned that day and generated questions for which they wanted answers. One expectation placed upon the teachers was that they would spend a few minutes each day writing reflectively about the day's events and their thoughts and feelings about their experiences. Those journals are the source of the following description of the program and the perceived effects upon participants.

Orientation to the Awareness to Action Program

The activities of the first day included discussion of the objectives and requirements of the course. The 19 participants and the co-directors introduced themselves through a mnemonic "name game." Bogan administered the Gregorc Style Delineator to identify the participants' learning styles and then assigned everyone to four groups that were heterogeneous in terms of learning style. Each group considered an environmental issue, using McClaren's processes for attaining environmental literacy: knowing, valuing, acting, judging, opening, imagining, connecting, and inquiring.

In their reflective journals, the participants disclosed some feelings of anxiety about taking a course that was not a "standard" classroom course. They liked the pedagogical techniques, including the "habitat lap sit," the "name game," and orienteering. Most of the journal material from the first day consisted of reiteration of the day's activities and content. Several participants paraphrased Commoner's *Laws of Ecology* and Bateson's *Commandments*. Clearly, most of the members of this project came with an attitude of openness to new activities and techniques to use in their classes. The opening day seemed rewarding to them.

Environmental Studies at the Penny Farm Nature Center

After a two-hour introduction to identification of local plant species in the herbarium, the Awareness to Action project moved into a series of scientific studies spanning three days at the Penny Farm Nature Center about 30 miles northwest of the Jacksonville State University campus. Using the transect and quadrat method, the participants identified plants and sampled and identified insect and aquatic animal species. Biologists taught the procedures for a mark and recapture procedure for estimating the population of grasshoppers at the site.

During these three days the participants thought about themselves as teachers and about the students they teach. According to the reflective journals, they saw value in the teaching and learning techniques employed by the project staff to develop content and pedagogical knowledge, environmental awareness, and a group spirit. A new appreciation for working in small groups began to emerge.

For some class members the science content was new, as were the data collecting procedures. They saw value in both for their own students. At the Penny Farm participants began connecting the disciplines of biology and geology and botany and invertebrate zoology. They started linking ethical thought with the biological imperatives. A few of the teachers expressed their own connectedness to what had been, only a few days before, an unknown piece of abandoned farm land. Some of them saw the growing importance of their connectedness--friendship and collaboration--with one another.

Environmental education content was the least mentioned aspect of the three days at the Penny Farm. It appeared that environmental education was the vehicle through which participants assimilated unfamiliar pedagogical techniques. During this phase of the program some who had been apprehensive about confronting new science content became more comfortable with being learners.

Environmental Studies and Outdoor Education at Little River

The last day at Penny Farm ended in tiredness from the activities in the hot summer sun and anticipation of the next day's planned activities in the scenic Little River Canyon, the deepest canyon east of the Mississippi. The teachers went to the canyon to conduct water analyses, invertebrate aquatic sampling, and plant and animal surveys. The experience included an overnight stay in a "primitive" campground. Following a steak supper, a consultant led the group in singing, signing, and storytelling with a focus on Native American lore and environmental ethics.

The reflective journals revealed considerable excitement about being outdoors with the class in such a lovely, peaceful place. Individuals began to recognize that they were "bonding" with the other members of the class. Various members found themselves more in touch with their own needs than they had been before. Certainly, they felt in touch with the earth and with the living creatures around them. Some participants felt a new urgency about protecting this natural area from further incursion and destruction by humans. It was at Little River that most participants first expressed environmental awareness.

Curriculum Development Activities

The teachers spent most of days 7-9 preparing to write curriculum activities to be used in their classes. Easton introduced the organizing principles of cooperative learning and led the class through a structured controversy on an educational issue. A state senator interested in environmental protection spoke to the class on political action and answered questions about student participation in environmental politics. By way of a cooperative learning "jigsaw," the teachers read and discussed material on developing interdisciplinary lessons on Science/Technology/Society. On the eighth day of the program the participants brainstormed and did concept mapping of the topics they wanted to include in a collection of environmental education learning activities to be shared among themselves and, eventually, with other teachers. The next day small teams spent several hours writing teacher guides to the learning activities for the curriculum document.

The curriculum writing phase of the project began with a letdown feeling on the Monday after the camp out at Little River. Group activities and cooperative learning activities, however, soon had the participants' community spirit restored. Once again, the teachers seemed very receptive to pedagogical techniques.

Summary

This analysis of reflective journal content is but the starting point of a more thorough analysis in which we will triangulate reflective journal data with field notes and the curriculum materials developed by the participants. The following observations seem justified at this point, but are subject to modification:

- The Awareness to Action project led pedagogically-starved teachers to a commitment to try new strategies in their classrooms.

- Program participants bonded into a learning community and valued the activities through which that bonding occurred.

- The teachers discovered environmental education content as a vehicle that could be used to stimulate thought and proactive attitudes on environmental concerns in their classes without sacrificing adherence to state curriculum requirements.

- Most members of the newly-formed Northeast Alabama Network of Environmental Educators left their summer experience "fired up" about teaching environmental education across the curriculum.

- One of the 19 participants had an especially difficult time accepting the Awareness to Action program as designed.

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Environmental Education in Italy--A Project About a Transverse Approach in the Junior High School

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Introduction

The distinction between natural science, ecology and environmental education has in principle been acquired in Italy since the eighties. Most of the environmental education projects are based on the cognitive approach: the entire field of values and choices is nearly always ignored, as it was in 1985, when an exhaustive research (Bardulla, 1991) found environmental education as the mere study of topics, part of "science" teaching.

The qualified research on scientific and methodological basis of the environmental education hadn't succeeded in giving stimuli to promote reflection and change:

1. because of an extremely poor connection between universities and the school system;
2. because of an extremely poor financing by local authorities and firms to environmental projects;
3. because of huge differences among regions in the country that pushed towards an uniformity "to the bottom".

The experience of the center where we are working in (Italian Center of Research and Environmental Education-C.I.R.E.A.-University of Parma, Italy), dates back in time. The ideas, objectives and suggestions from several experiences are globally infused in different projects. The last one is on "Transversality of Environmental education in the Italian Junior High School".

The Project

The project we are telling about is fitted into the organization of the junior high school.

This school was selected because of its critical position between primary and high in a particularly important period of children' psycho-physical development.

This school in Italy is shaped by some organization formulas, as follow:

1. there are national curricula and fixed compulsory subjects. The week of school is 30 hours;
2. in September, at the beginning of the school year, a board of teachers define groups of just enrolled pupils forming "le classi". Those groups remain the same as they were formed all the three years except for failures of someone of the children;

Our environmental education project is a three years experiment, starting September 1992, working in the normal school live. That means that we are moving with little funding, inexpensive tools, not particular teachers' training at the beginning.

The aims of the experiment is also a non hierarchical interdisciplinary teaching approach to Environmental education and the evaluation of its importance for the promotion of a new behavior toward the environment.

"Transversality" in teaching, with its emphasis on the equal relevance of all subjects, stimulates by itself a reflection on man's responsible relations with his environment. The method by which transversality is carried out is the interdisciplinary (Moroni, '78; Bachiorri & Moroni, in press). Every subject can incorporate, into its own ministerial program, also specific topics that must be taught not using only traditional strategies and instruments. The specific contribution of the project, but also its difficulty, will be the concrete experimentation of the interdisciplinary method.

Our research is currently being carried out in the Province of Parma (Italy); it involves five schools in different environmental contexts: the city (downtown and suburban), the countryside, the hillcountry, the Apennine mountain range.

In each school two first classes are selected. In one of these, in accordance with the agreement of the whole class council, the experimentation will be articulated for all the three years, while the other class acts as control.

Different approaches (natural science, demographic, economic, aesthetic) are proposed to the students to study of the structure of their own living human environment to guarantee a highly affective involvement. Every teacher has identified specific contents and activities. In this way each class has built one's own itinerary, with different modalities and instruments.

At the beginning of the school year, some meetings with all the teachers involved are organized. Methodologies such as questionnaires and interviews for teachers and students are prepared by the project staff (Psychologist, Teacher, Pedagogist, Ecologist) to evaluate how the activities proposed according to the transverse approach trough out the different disciplines, can stimulate the acquisition of new values, awareness and attitudes in pupils and teachers.

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Results

Some trends have clearly emerged at the end of the first year of the three year project:

1. class groups worked with different strategies;

2. the survey carried out by questionnaires and interviews showed patterns common to most Italian schools and American schools too (as it emerges from published reports):

    - short time allocated to environmental education, and lack of funding;
    - environmental education conceived as a separate matter in addition to the normal curriculum;
    - difficulties to carry on the interdisciplinary approach;
    - real methodological difficulties are still existing in distinguishing "environmental", "ecology", and "natural science" education;

3. analysis of different teachers' methods often showed the cognitive approach to be overestimated, affective approach largely overlooked and behavioral approach simply forgotten;

4. like students, teachers too require more knowledge and understanding about the role everyone plays in the environment, with specific suggestions on the relationships between individual actions and solutions to environmental problems produced by those actions (Gigliotti, 1990).

5. teachers worked hard in groups on a common project: they always needed documentation, but also ideas and continuous help to make environmental education the fulcrum around which entire education can proceed (Simmons, 1989);

6. schools in countryside and mountain areas, apparently the most culturally isolated, seem to be more able than the others to link the project activities to their specific environment.

Those are the very first observations. The experiment evaluation will be done at the end of 1995, when we will be able to present a full measure of the cost and benefits both in terms of educational effort and new awareness.

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Can We Teach Environmental Problem Solving?

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If we were to ask participants at this conference to state the chief objective of environmental education, no doubt most responses would mention teaching environmental problem solving. Environmental problem solving has been the cornerstone of environmental education almost since its inception. Indeed the Tbilisi Declaration on Environmental Education, the seminal document for this field, states that the basic aim of environmental education is to help "individuals acquire the knowledge, values, attitudes, and practical skills to participate in a responsible and effective way in anticipating and solving environmental problems." (UNESCO 1980).

Three variables distilled from this statement were investigated: problem solving skills, empowerment and interest. Environmental problem solving skills are synonymous with the "practical skills" cited above. Interest can construed as a component of attitude about environmental problems, and empowerment is related to effectiveness.

Action Research Community Problem Solving, a program developed at the University of Michigan School of Natural Resources in collaboration with Deakin University in Geelong, Australia, was designed to meet these same goals (Wals et. al. 1989, Bull et. al 1988, DiChiro and Stapp 1986). This study focuses on its implementation in two junior high schools in the inner city of Detroit from October 1987 through June 1989.

Methods

A pilot study with an eighth grade class in one of the schools provided information about problems that were of interest to inner city Detroit students. These, together with a list of "traditional" environmental problems generated by the author, formed the basis for the instrument used in this study. For empowerment and interest students were presented with a list of 46 problems and asked to rate each as to how much interest they had in that problem and the degree to which they felt they could be effective in solving it ("empowerment"). Two dimensions of problem solving skill, action strategy choice and information gathering were investigated by presenting students with several problem scenarios then asking them to choose which among a number of potential actions they would likely take in that situation, and from among a number of information sources which they would most likely consult. All these questions were included on one instrument which was administered before and after the project.

The study consisted of three experimental and four control classes; a total of 211 students. Control groups were selected so that they had the same teacher, similar academic ability and similar demographics as the experimental classes. Students in the experimental classes participated in an Action Research Community Problem Solving project, including choosing an environmental problem as a class and then working to solve it. Projects ranged in length from four to eight months. Control classes did not participate in action projects; their only participation in the study was to fill out the pre and post test surveys.

The Guttman-Lingoes Smallest Space Analysis ,SSA III (Lingoes 1972), a non-metric factor analysis was used to group the survey items into a smaller number of scales for further analysis. Pre-test responses of experimental and control groups were pooled for this analysis to ensure an adequate sample size. At this stage of the study neither the experimental or the control group would have been affected by the experimental manipulation. The scales then reflect the a *priori* world view of the inner city students in this study. The SSA III analysis yielded five empowerment scales, five interest scales and five problem solving scales. Answers to individual question were analyzed as well.

Results and Discussion

The empowerment scales were: Persistent Neighborhood Problems, Persistent Problems Beyond the Neighborhood, Neighborhood Appearance, Urban Nature, and Sexual Consequences. Interest scales were similar. Finally problem solving skill categories were: Find out everything about a problem and tell somebody about it, changing the cafeteria menu, call powerful others, consult newspapers and teachers, and seek expert advice about environmental problems.

In each case there were significant differences between the ratings of these scales strongly suggesting that empowerment, interest and problem solving skill are domain specific traits. While other studies have demonstrated domain specificity of these constructs (Paulhaus and Van Selst 1990, Voss et. al. 1983, and McGuire 1976), the domains in this study seem to be much more specific than has been previously reported. Lopez and Staskiewicz (1985), Lange and Tiggeman (1985), and Berndt (1978) have described personal and political problem domains, while Paulhaus and Van Selst (1990) have added a domain of interpersonal issues. This study demonstrated that the domain of "political problems" was much too broad. There were five domains of political problems in this study, all based on the kind of political problem. Simply put, students felt more empowered, more interested and more skilled with respect to some environmental problems than others. This finding calls into question the use of Locus of Control instruments which have traditionally been used to ascertain level of "empowerment."

The bad news is that it may not be possible to teach "environmental problem solving" except in the context of one kind of problem. There is no guarantee that learning problem solving in one environmental domain will transfer automatically to another one. The good news is that If other studies collaborate this finding we may find out that students are more empowered, interested and skilled in problem solving than we previously thought. Global measures, like locus of control which has traditionally been used to assess empowerment, may have masked these domain specific achievements. While we may not be able to teach "environmental problem solving" per se, it is clear that we can help students to become efficacious in solving specific environmental problems.

Secondly, working on an action project did not result in significant differences in empowerment, interest or problem solving skill with respect to the factor analysis derived scales. In finer grain analysis of individual items, there was a more disturbing result. On five items the control group increased in empowerment while the experimental group decreased in empowerment with respect to five different items. This raises the question of whether the experimental group was somehow impeded from feeling empowered on these problems as a result of this project.

Simmons and Parsons (1983) had similar results in a study of the effectiveness of an instructional program designed to increase feelings of empowerment in adolescent girls. "Underclass girls" significantly decreased in perceived competence after completing that program. It may be that some well intentioned instructional programs can be harmful. It is more likely that lack of success, lack of structure, lack of adequate information and lack of social support were not adequately addressed in our program. If one tries to take action and is unsuccessful, feeling less empowered should be expected (Bandura 1990). On the other hand, the control group's more hopeful view of their efficaciousness is not surprising considering that they had not yet been jaded by frustrations inherent in the actual problem solving experience itself.

Is there any hope that skills learned in the context of one problem can be of help to students in solving different problems later on? Is there hope that we can we help students to get over the hump of frustration that may result in decline in their sense of efficacy. Fortunately there is. Experience with more than one action project may help build a cognitive map to a wider problem space (Bull et. al. 1988). Monroe (1991) and Bardwell (1992) discussed the positive impact of vicarious problem solving experience through exposure to success stories of others involved in solving environmental problems. While skills, interest and empowerment do not automatically transfer from one problem to another, experience with a variety of problem spaces and explicit comparisons of similarities and differences to one's own problem solving experience seems to be key. These discussions enable students to store "problem solving" information in such a way that it can retrieved for use in more than one problem, because the relationships between these problems and approaches to dealing with them have been made clear.

Kaplan and Kaplan (1982) have discussed the importance of structure in building cognitive maps. Taylor (1989) and Gruber and Trickett (1987), Mohai (1985) and Brody (1982) have demonstrated the importance of information in developing feelings of efficacy and skill in problem solving. Because student choice was valued so highly, this study may have given students too much freedom while neglecting the structure and information resources which are necessary for the experience of success. Too often, when we over-emphasize process to the exclusion of content, we may draw too heavily upon what students already know without considering that with regard to taking action on some of these problems students may wrack their brains but find nothing there to help them. Information is power, and information that is structured is more easily assimilated. We may be forced to admit that process isn't enough. Maybe we do have some knowledge via experience that is worth imparting to the younger generation after all. This does not mean we disregard students' own valuable experience and perspectives, it's just that this may not be sufficient. A "both and" approach is needed.

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Inclusion of Environmental Pollution Concepts in Taiwanese Elementary Curriculum

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Introduction

During the past four decades, Taiwan, R.O.C. has progressed from a underdeveloped country into a developing country. The economic progress indeed is quite important to the improvement of local people's quality of life. On the other hand, pollution issues have become a threat to local people. It's almost a shame that whatever pollution issues you can identify around the world, you can also find them in Taiwan. To name just a few of them (the more obvious ones): air pollution in most cities, water pollution in most major rivers, noise pollution everywhere, nuclear waste disposal, soil erosion in many coastal areas, deforestation, and many others. Several hidden pollution issues include (but not limited to): the leaking underground storage tanks (LUST), drinking water pollution.

Because of these many pollution issues occurring at the same time in Taiwan, they surely become the eye-catching headlines in almost everyday news. To ease people's uneasy about such pollution issues, and to actually overcome as well as improve the quality of life and the quality of the environment (if indeed they can be separated from each other), the government established the Environmental Protection Agency in 1987. Numerous strategies have been devised and implemented to practice what the agency preached when it was established. Environmental Education is one of the strategies that is used to help the public, especially the school students, to get to know the environment. Described below are the current practices of the individual environmental education programs.

Outdoor Education:

Four practices of outdoor education have been identified. They are: single spot, multi-spot, tracking, and river water quality monitoring project. Quite a few outdoor classrooms equipped with trained interpreters have been established to facilitate students' learning. The single spot and multi-spot outdoor education programs are viewed as equivalent to the bus tour to almost every school student. The tracking program is similar to the nature tracking in many environmental education centers in the United States. Nevertheless, all the major outdoor education programs currently practiced need to be refined to a certain degree.

Infusion Model:

Infusion model is another major approach to implement environmental education in the school system. Subject areas covered are: biology, health education, home economics, earth science, chemistry, etc. However, due to lack of deep understanding about environmental education, these materials are quite science oriented, or provide single view points about environmental issues only. Meanwhile, the elementary school curriculum consist of so many subject areas without interrelationships among them, which makes transdisciplinary approach difficult, if not impossible, to implement.

Recycling Education:

Recycling education is probably the environmental education program most valued in most local elementary schools. It is frequently used to evaluate a school's environmental education program. Students recycle aluminum cans, tin cans, plastic bottles, newspapers, glass through a special agent: the Taiwanese Solid Waste Disposal Company (TSWDC). The recycling program in the elementary schools seems all right for the students. However, numerous elementary school teachers complained that the TSWDC often terminates the recycling of certain recyclable without any warning.

Enriched Supplemental Materials for Pupils:

Different from many other countries, numerous enriched supplemental materials have been made available to elementary school's students to read during their leisure time. Educators believe that elementary school pupils can teach their parents about environmental issues after they have learned various environmental issues by themselves. Such a child-to-parent transfer has been widely implemented locally to teach both children and their parents at the same time. Nonetheless, such a transfer process has not been studied to any degree before its wide uses.

No matter which program or any combination of them is used to implement environmental education in the school system, the learning has to be made more meaningful to the students. As a result, environmental education concepts have to be arranged in a sequential, and meaningful way. Chou and others (1991) identified environmental education framework in six major categories to be used in Taiwan.

Methodology

This study focuses upon the pollution category of the Chou's list. This category consists of five sub-concepts. To further identify pollution concepts in the elementary schools, a modified Delphi method was used as follows.

> Major pollution concepts extracted from the **Essential Learnings in Environmental Education** (NAAEE) were used as the backbones of the study. As a result of the first stage, sixty six (66) items were included in the questionnaire. This questionnaire was sent to six environmental educators to be examined.

Feedback's from the first run provided some major changes in the questionnaire. The average scores of the individual items were listed at the end of the items for the reference of the experts. A total of seventy two (72) items were included in the second run questionnaire. Feedback's from the second run consisted of fifty two (52) items.

After the examination of the questionnaire by the experts, six elementary school teachers were invited to examine the questionnaire to make it more teacher friendly. The six elementary school teachers were asked to make the wording more readable to other elementary school teachers. Finally, the questionnaire was sent to about two hundred teachers to distribute to their colleagues.

Results

A total of fifteen hundred and seventy six (1576) questionnaires were mailed, with a total valuable returned questionnaires of twelve hundred sixty eight (1268). The return rate was eighty percent (80%). The demography of the participants included 366 male teachers (28%) and 902 female teachers (71.1%). The pollution concepts are listed in the following table (each grade adds onto its previous grade):

Grade 1

Item 1: The air, water, and food that human beings need to survive all come from nature.
Item 2: Noise is defined as the sound which make people uneasy or uncomfortable.
Item 3: Garbage reduction is the most effective way to reduce environmental pollution.
Item 4: Environmental protection is the responsibility of the individual citizen as well as the society together.

Grade 2

Item 5: The trash we throw in the streets, fumes from our vehicles, and wastes from our factories cause pollution and create health problems for all of us.
Item 6: Continuous noise pollution can cause physiological damage to the human health.

Grade 3

Item 7: Pollution is any addition of unwanted substance to or alteration of the environment that adversely affects human health or living systems.
Item 8: Waste water from factories, apartment complex, school labs, hospitals, and recreational areas has to be treated before its releasing into local rivers.
Item 9: The major water pollutants are organic wastes, pathogens, nutrients, synthetic organic compounds, oils, heavy metals.
Item 10: Residues of pesticides, fertilizers and other chemicals which leach into water bodies can cause water pollution.
Item 11: There are ways to reduce noise pollution, planting trees is one of them.
Item 12: The land is an important source of food and water. It is the structural component of all terrestrial habitats.
Item 13: Preventing pollution costs less financially and environmentally than cleaning up after it has occurred.
Item 14: Pollutants accumulate in our bodies from a combination of sources: the air we breathe, our food, and our water.

Grade 4

Item 15: Natural resources may be classified as renewable (e.g. water, plants, animals) or non-renewable (e.g. minerals).
Item 16: Growing population, increasing individual consumption and poor management are leading to a decline in natural resources.
Item 17: Dumping solid wastes into wetlands, beaches, and sea shores can cause water pollution as well as soil pollution.
Item 18: Effective using energy consists at least reducing consumption and recycle recyclable products.

Grade 5

Item 19: Non-renewable resources (e.g. petroleum, coal) take a long time to replenish in the natural environment, we need to carefully protect them and to recycle them.
Item 20: Environmental pollution consists of air pollution, water pollution, solid waste pollution, noise pollution, radiation pollution, and soil pollution.
Item 21: We are facing an insufficient water supply.
Item 22: There are many varieties of solid wastes, if handled improperly, they can cause air, water, and soil pollution.
Item 23: Over uses of chemical fertilizers, pesticides can cause soil and water pollution.
Item 24: To learn and understand natural resources is the best way to conserve natural resources, and leave natural resources to the generations to come.
Item 25: It is necessary to safely handle solid wastes if human beings want to live safely in the environment.
Item 26: The most important factor in the prevention and control of pollution is education and the resulting changes in people's values, attitudes and behavior.

Grade 6

Item 27: Searching for alternative energy is not conserving resources, the best way to conserve resources is energy conservation.

Conclusions and Recommendations

Now that we have revealed the twenty-seven (27) pollution concepts suitable in the elementary school teaching. Environmental educators have to arrange these concepts in a sequential manners to make them meaningful for elementary school students to learn. One strategy is to restructure the complete elementary curriculum to make it easy to have transdisciplinary approach. The other strategy is to have an independent course, such as environmental studies or environmental education.

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One Bird-Two Habitats--Bridging the Gap Between Research and Education

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Research Base

Although complete consensus has not been reached and research is contradictory, some bird watchers and researchers observed that some populations of birds have been declining. Long distance migrants seem to suffer more than other birds. Questions have been raised about the reasons for apparent population declines: are bird populations declining because of habitat degradation and decreased habitat in the breeding grounds, the wintering grounds, or in the rest areas along migration routes? While researchers struggle to answer these questions and determine the best management plan to conserve birds, educators aim to alert the public that some migratory birds might be in trouble.

Curriculum Development

Believing bird populations are indicators of the health of the planet and that decreased or degraded habitat in any of the places that migratory birds depend on could be a serious problem, staff in Wisconsin's Department of Natural Resources created a project to teach about this issue: One Bird-Two Habitats. With funding support from the National Association of the Partners of the Americas-Wisconsin-Nicaragua Partners, the Center for Biology Education-U.W.-Madison, and the U.S. Forest Service, the Project focused on neotropical ("neo" referring to the new world or the Americas, "tropical" referring to the latitudinal region called the tropics) migratory forest birds. Covering grasslands, wetlands, and forest ecosystems as bird habitat seemed overwhelming, so forest habitat was selected.

As environmental issues facing birds that migrate across national borders are clearly global in scope, we selected "interconnectedness" as our theme: interconnectedness of birds, forests, and people. We made the issue concrete by focusing on Nicaragua as our Central American sister state. Aside from a general concern about rain forest destruction, many students and teachers knew little about Nicaragua.

To further personalize the issue, we chose the Ovenbird as "ambassador" bird. The Ovenbird uses forest habitat in both its breeding and wintering range, including Nicaragua. While Partners in Flight, the federal interagency effort to conserve neotropical migrants, reported that Ovenbirds have suffered a serious population decline (65% or more), they are still common in Wisconsin, yet little known among the general public.

The network supporting this curriculum has been grand scale from funding to writing, piloting, and dissemination. Experts in birds, forest ecology, Central America, and education participated in a kickoff writers'

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workshop in March 1992. Nicaraguan Ministry of Education staff helped set up cultural exchange packages between classes in Wisconsin and Nicaragua. Consultants helped incorporate the theme of interconnectedness through cooperative learning methods. Videotape drafts to introduce the unit were presented to three different audiences for review and revision. Approximately 50 people were invited to review the curriculum draft in Jan. 1993 and revisions were incorporated. In March 1993, the curriculum was ready for field testing.

The Pilot

Twenty-two 6th, 7th, or 8th grade science teachers conducted the pilot of what we billed as a three week unit. Some teachers expressed special interest in birds; some knew very little about them. They participated in the project to increase infusion of environmental education, to get away from textbooks, to fill a gap in science curriculum for that age group, or to pursue an interest in birds. Pilot teachers attended a preparatory, day-long workshop, where they received materials, practiced activities, reviewed cooperative learning techniques, and learned some background information.

Evaluation Methods

To improve the curriculum, an evaluation was conducted during the pilot. Researchers conducted 98 classroom observations, seeing at least part of every activity in the curriculum. Seventeen teachers were observed: one was observed daily; most were observed at least twice. A total of 250 student interviews were conducted, reaching approximately 10% of the pilot participants. Approximately 1650 students completed surveys administered before and after the unit. Survey responses were coded as more or less correct in relation to the curriculum and a preliminary statistical analysis conducted. Twenty-two teachers completed questionnaires and attended focus groups. A simulated Town Meeting activity was designed to help ascertain whether core concepts were being conveyed by the curriculum.

Preliminary Findings

Findings are being applied to specific curriculum revisions, general environmental education effectiveness, and methods of education evaluation.

Teachers and students generally liked the activities. All 22 teachers completing the questionnaire said they would teach the unit again. The main problem was lack of time. There were many more activities in the curriculum than could really be accomplished in a three week unit. Yet teachers chose to spend more time (4-6 weeks generally) on the unit, rather than drop more activities. Through focus group discussions, teachers expressed strong interest in future interdisciplinary teams, with Math, Science, Art, Language Arts, Social Studies, and Spanish teachers each covering part of the unit. This integrated approach would reduce the amount of time required in science class and spread the word about the issues facing migratory forest birds through a wider network. Teachers found the workshop extremely useful in getting ready to teach the unit, but preparation, particularly gathering materials for specific activities, was time-consuming. They expected preparation time would decrease the second time they used the unit. They recommended adding a list of all materials needed for the unit and more prepared student handouts. Some teachers had students make notebooks and they liked the idea of incorporating journaling into the curriculum.

Although some teachers were anxious about using cooperative learning beforehand, they liked the method and students liked cooperative groups. Observations showed, however, that teachers didn't always have time to process the workings of cooperative groups. Sometimes specific cooperative learning techniques were not employed, but students simply worked in small groups. Teachers considered cooperative learning groups of 5-6 students too big at the middle school level.

Teachers wanted more related to Nicaragua in the curriculum. Many of them knew little about our Central American partner. Students particularly liked the cultural exchange with Nicaraguan classes, although the activity has proved problematic because of differences in mail service, language, and economic conditions in Nicaragua.

Students especially liked active participatory kinds of activities and going outside. Teachers were appreciative of the flexibility of the curriculum in not requiring field trips to forests, but offering adaptations for activities to be conducted indoors or out. Teachers of inner city students had more difficulties with the activities, partially due to limitations of the setting for activities like putting up bird feeders, student noise levels that prohibited listening to directions or participating in discussion, and, according to one teacher, an idealism assumed by the curriculum that inner city students didn't share.

Teachers were enthusiastic about student learning from the curriculum and researchers generally agreed the activities were successful. However, observations and interviews suggested that the concepts behind the activities were not always conveyed to the students. Frequently the bell rang before there was time to focus the learning through discussion. In some simulated Town Meetings, students were sidetracked from the plight of forest birds to discussing the cost of replacing forest with recreation areas. In others, discussion included the needs of birds as well as people.

In a paired t-test of student survey scores in a random sample, improvements from pre- to post-unit were highly significant. The unit has increased student interest in birds, introduced the Ovenbird as an interior forest bird, pointed out that human changes of land use, such as forest fragmentation, affect birds, demonstrated that people in Central and North America both depend on forest products, conveyed the notion that environmental issues are global, put Nicaragua on the map, introduced methods researchers use to study birds, and empowered students to take action to support birds. Pilot teachers appreciated the positive attitude embraced by the curriculum, yet others want more direct student action for migratory bird conservation. More students mentioned conserving habitat as a way to help birds in post-unit surveys than in pre-unit responses, but many still referred to feeding birds as a way to help them. While student surveys demonstrate increased understanding of specific ideas related to the curriculum, further data analysis will show us more about student learning.

Summary

Data from all sources indicated that One Bird-Two Habitats is an effective program and curriculum revisions need not be major. Observations of individual teaching styles and class composition affecting delivery of the curriculum indicated that, to be effective, education programs must have key concepts and focal points clearly defined, yet offered in a flexible format that teachers can adapt. In addition, this research shows that one method of data collection is not likely to provide a complete evaluation of an education program. Teacher conclusions, students representations, and researcher observations were not always consistent. But by examining information from these sources together, we can make recommendations for effective education programs.

Testing Racial Theories Through a Qualitative Study of Factors Influencing Racial Diversity in Environmental Education

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Various theories have attempted to explain apparent racial differences in interest in environmental issues, outdoor recreation and wildlife on the basis of either societal marginality, ethnicity, socioeconomic status, opportunity, or ancestral mythology. While all of these theories have not been directly applied to environmental education, the theoretical constructs underlying each might be seen as directly transferable. None of these theories has been conclusively validated in previous quantitative studies, implying a need to develop alternative frameworks. After briefly summarizing each theory, this paper will present an alternative theoretical framework developed through a qualitative study of factors influencing racial diversity in environmental education, which can be applied by environmental organizations seeking to diversify their staffs and memberships.

Existing Theories

The theories appearing most frequently in the literature are the marginality, ethnicity, socioeconomic and opportunity theories. The marginality theory considers differences in participation to be artifacts of the persistent impact of discrimination (McDonald & Hutchinson, 1986, citing Murphy, 1974; O'Leary & Benjamin, 1981). This can result from the historic prevalence of discrimination throughout society in the United States, as well as the existence of specific discriminatory policies.

The ethnicity theory describes variations in participation as "a function of values, social organization and normative elements [of various cultural groups]" (McDonald & Hutchinson, 1986, p. 44). Results of studies attempting to directly measure the impact of cultural characteristics vary (Carr & Williams, 1993; Floyd & Gramann, 1993; Hutchison, 1987; McMillen, 1983; West, 1989).

The socioeconomic theory attributes differences in participation levels to social class (Kreger, 1973, McDonald & Hutchinson, 1986; Wagner & Donahue, 1976). Interest in environmental issues, and outdoor recreation, are assumed to be luxuries that can be pursued only after more basic needs are satisfied. While some studies found socioeconomic status was far more important than race (Yancey & Snell, 1971), some found less correlation between socioeconomic status and participation than between race and participation (Irwin, Gartner & Phelps, 1990; Stamps & Stamps, 1985), and others found that variation between races persisted when socioeconomic status was held constant (Antunes & Gaitz, 1975; Hutchison & Fidel, 1978; McMillen, 1983; Washburne, 1978).

The opportunity theory attributes variation in participation to differences in opportunity, which in turn may be related to discretionary time and money (Lindsay & Ogle, 1977; McDonald & Hutchinson, 1986; Dolin, 1988), availability and accessibility of facilities (Craig, 1972; Lindsay & Ogle, 1977; Washburne & Wall, 1979; Yancey & Snell, 1971 cited in McDonald & Hutchinson, 1986), and urban versus rural residence (Craig, 1972).

Theories proposing that the underrepresentation of people of color in outdoor recreation participation have also been based on mythology and negative historical associations with the land, although these theories have not been empirically tested (Meeker, Wood and Lucas, 1973).

Previous research has found inconclusive results in testing each of these theories. Furthermore, cross studies comparisons often find contradictory results. This implies that new research to re-examine our theoretical perspectives regarding race.

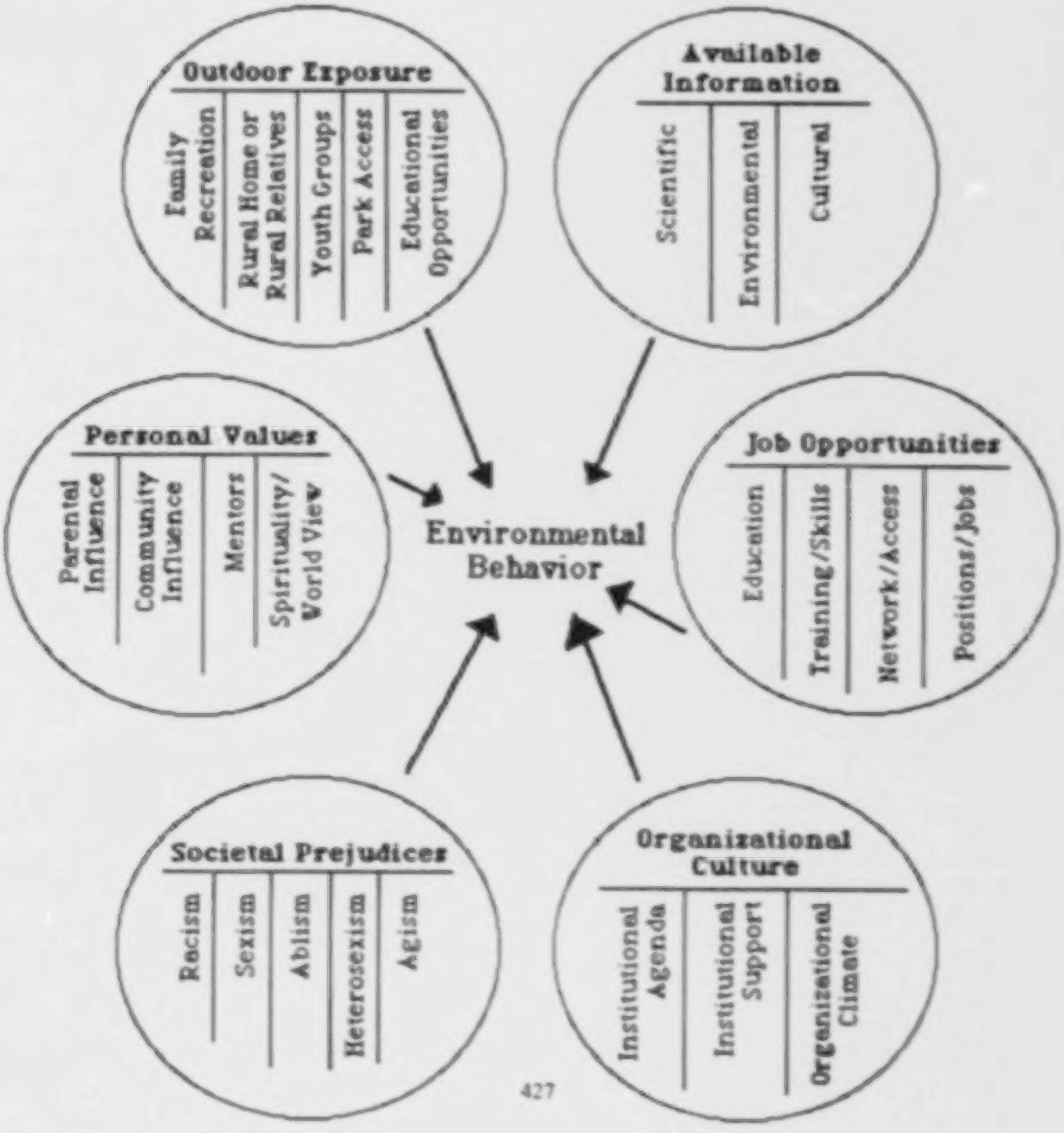
An Alternative Theoretical Framework

A qualitative study consisting of in-depth interviews of 50 people of color working in environmental education provided new insights into the factors which might lead one to pursue a career in environmental education (James, 1993). A new theoretical framework for addressing differences in participation was developed based upon the results of this study. This theoretical framework addresses the multiplicity of factors shaping environmentalism by clarifying the opportunity structure promoting careers in environmental education.

The theoretical construct of an opportunity structure has been applied in a variety of fields, including education (Crow, 1989) and labor (Johnson & Herring, 1989), to describe the dynamic interrelationship between variables influencing success in specific situations. Since the development of environmentally conscious behavior appears to be the result of an extended socialization process, rather than the successful outcome of a specific situation, the theoretical construct of an opportunity structure has been expanded to produce an opportunity system. This theoretical construct is distinct from the opportunity theory since it addresses interrelationships between factors rather than focusing on specific experiences. This opportunity system is composed both of external forces shaping the life circumstances of an individual and internalized forces which, through long term socialization, shape the meaning an individual will assign to physical, social and abstract objects.

The results of this qualitative study indicate that the opportunity system is comprised of six major components: outdoor exposure, factual information, job opportunities, organizational culture, personal values and societal prejudices (see Figure 1). Each major component contains several subcomponents. The combination of components and subcomponents within a given individual's life circumstances promotes or prohibits development of environmentally conscious behavior patterns for that individual. Although positive aspects of all six component may not be present, the probability of exhibiting environmentally conscious behavior increases as each component is added to an individual's life circumstance.

Figure 1: Opportunity System Influencing Environmental Behavior


Outdoor Exposure
Family Recreation
Rural Home or Rural Relatives
Youth Groups
Park Access
Educational Opportunities
Available Information
Scientific
Environmental
Cultural
Personal Values
Parental Influence
Community Influence
Mentors
Spirituality/World View
Environmental Behavior
Job Opportunities
Education
Training/Skills
Network/Access
Positions/Jobs
Societal Prejudices
Racism
Sexism
Ablism
Heterosexism
Agism
Organizational Culture
Institutional Agenda
Institutional Support
Organizational Climate

This theory incorporates racial identity as one factor within the overall opportunity system. While race is acknowledged as potentially influential in the development of environmentally conscious behavior, it is not seen as a pivotal issue. Consequently, according to this model, racial diversity in environmental education can be increased by addressing the interrelationships between racial identity and the other components within the overall opportunity system.

Pragmatic Implications

Applying this theory suggests a variety of means to promote greater racial diversity within the field of environmental education (James, 1993). For example, facilitating greater access to outdoor experiences through school programs, programs for youth groups such as scouts, or family programs in *collaboration with existing organizations within the targeted communities, including community groups and church groups*. Affordable public transportation to parks, lowering or eliminating park entrance fees, and increasing park safety may increase access to parks. Increasing the availability of information entails utilizing new channels of communication such as community newspapers, radio and television to provide not only scientific information and information about specific environmental issues, but also information addressing historical contributions or the impacts of environmental policies on various racial groups.

Availability of job opportunities can be effected on many levels, including providing internships, and recognizing transferable skills attained through jobs or training in other fields. For example, experience in management or publishing can be gained in many fields, and can be immediately applied within environmental organizations. Organizations might need to recognize the ability to reach populations not currently included within the organization as a job skill considered in hiring. *Access* to job opportunities must also be addressed. Positions need to be advertised through a greater variety of media, including newspapers, magazines and radio stations targeted to people of color; through educational institutions with a large portion of their student body composed of people of color, including Historically Black Colleges and Universities, institutions within the Hispanic Association of Colleges and Universities, and Native American Tribal Colleges; and through professional organizations such as Minorities in Natural Resources, Agriculture and Related Sciences or the Society for Chicanos and Native Americans in Science.

Changes in the organizational culture include examining internal channels of communication since communication patterns may favor specific groups. Organizations may need to promote staff mentoring programs or support groups for people of color, thereby easing adjustment to the organization and potentially increasing staff retention.

Personal values can be affected in at least three ways: providing role models and mentors from diverse racial backgrounds, addressing parents and building partnerships with community organizations. This might encourage individuals to seek ways that environmental work compliments their own personal values, rather than perceiving this work to be foreign to their value system and the values associated with their community and cultural heritage.

The final issue to address is racism. Environmental entities will not be able to eliminate racism as a societal force, but they can do several things to minimize the impact of racism. This includes seeking information about historical contributions of a variety of cultures and the differential impact of environmental policies on various racial groups, open communication with people of color and organizations representing people of color, guarding against tokenism within this communication (McClintock, 1989), working to increase staff awareness of racism, and rewarding staff who promote racial diversity in environmental education.

Summary

Rather than focusing specifically upon race, this theoretical framework addresses the interrelationships between racial identity and the other components within the overall opportunity system. Environmental organizations are encouraged to promote greater diversity in environmentalism through recognizing differences in access to the various components of the opportunity system, and working to foster greater access to each of these components for all students.

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Environmental Education in Wisconsin--A Teacher Survey

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This study assessed Wisconsin teachers' perceived competencies in, attitudes toward, and class time devoted to teaching about the environment. A valid and reliable survey instrument was developed and mailed to 1,545 randomly selected Wisconsin elementary and secondary education teachers. The response rate was 59% (N = 915).

The format of the instrument contained items designed to address research questions developed for the study. These research questions included the following:

1. To what extent do teachers perceive they are competent in teaching about the environment, including:
    - a. addressing the cognitive learning outcomes of EE
    - b. addressing the affective learning outcomes of EE
    - c. addressing the behavioral learning outcomes of EE

2. To what extent do teachings agree that meeting the goals of EE are important in K-12 school systems.

3. How much time do teachers report that they spend teaching about the environment?

The research questions for EE teaching competencies were derived from a construct created for the study. The competencies in the construct were patterned after Wisconsin's EE certification rule (Engleson, 1985) and were further refined based on the environmental literacy components outlined by Iozzi et al., (1990).

A validity panel composed of sixteen professional environmental educators was formed to assess content and construct validity. The pilot was administered to seventy-eight teachers.

Analysis of the Likert items by Cronbach's alpha correlation coefficient was used to determine instrument reliability. Two subscales were used to evaluate reliability. One subscale was teacher EE competencies (alpha = .8466); the other is teacher attitudes (alpha =.8950). The validity panel review and the pilot study results (reliability), supported the conclusion that the survey items consistently and accurately measured teachers' perceptions of their EE competencies and attitudes toward EE.

The analysis showed that teachers perceived they were competent in addressing the learning outcomes of EE. The results also identified certain variables that are characteristic of teachers who perceive themselves as competent in providing education about the environment. These variables include the following: preparation in EE during pre-service teacher education, participation in in-service EE courses, the possession of an EE curriculum plan by their school district, and the teachers' frequency of reference to this plan. Two of these variables, participation in one or more EE in-service courses and frequency of reference to the district's EE curriculum plan, have also been found to correlate positively with the amount of class time teachers devote to environmental concepts.

These findings are especially relevant as the analysis revealed that on average teachers report they spend less than one-half hour per week per subject teaching about the environment. In spite of the information gathered about amount of class time devoted to EE, it is important to note that this study concludes that teachers' attitudes toward EE are positive. They believe that the inclusion of EE concepts into their classroom teaching is important.

In addition to the above findings, the gathered information about teacher education in Wisconsin and about Wisconsin's EE mandates. Teachers were asked to report whether or not they received training in EE and how they felt about their preparation in EE. Overall, teachers were pleased with their EE courses, however, they were less pleased with the education they received in using affective methods and environmental action strategies to teach about the environment and related issues. Analysis revealed that the perceived competencies for teachers who have received teacher education in EE teaching methods are higher than mean responses of teachers without this experience.

The EE mandates investigated in this study relate to pre-service EE training requirements and school district implementation of a K-12 EE curriculum plan. This study has revealed that despite the 1985 EE teacher certification mandate, a large number of teachers are still being certified without prior training in EE teaching methods. Therefore, the Wisconsin DPI should review the pre-service environmental education provided at all Wisconsin teacher training institutions. Those institutions not meeting the mandate should develop resources and programs to provide pre-service teachers with EE preparation.

Many school districts still have not implemented EE curriculum plans despite the state mandate. This study provides evidence that the amount of time teachers devote to EE increases with increased reference to their EE curriculum plans. The DPI should survey school districts to determine which districts do and do not have EE plans. Furthermore, procedures should be developed to support districts in their efforts to developing and implement these plans.

The analysis strongly suggests that pre-service preparation in EE and EE curriculum plans contribute to teachers' effective classroom teaching practices in EE concepts. In other words, when the mandates are followed, the impacts of their directives can have positive effects on teachers' EE classroom practices. Therefore, it is recommended that steps be taken to motivate teacher education institutions to provide teachers with EE training and to support districts in implementing EE curriculum plans.

This valid and reliable instrument has been found to gather a wide variety of data about teachers' EE classroom practices and perceived competencies. As the survey discriminates between responses of teachers who do and do not perceive themselves as competent environmental educators, the instrument can be used to determine to what extent teacher education programs are meeting the EE needs of classroom teachers. In addition, similar assessments should be performed in future years and in other locations throughout the country and results compared to each other and to this current study. By performing more in-depth and tangential studies to answer questions and to address issues raised by this study, more positive steps will be taken to ensure that the quantity and quality of EE continues to improve.

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Project Learning Tree National Field Study

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PROJECT LEARNING TREE CURRICULUM REVISION

Since its introduction in the early 1970s, Project Learning Tree, has been recognized as one of the premier environmental education programs in the world. Through hands-on, interdisciplinary activities, PLT provides students with opportunities to investigate environmental issues, and encourages them to make informed, responsible decisions.

PLT is used in 50 U.S. States, U.S. Territories, Canada, Japan, Mexico, Sweden, Finland, and Brazil. Each year, nearly 60,000 educators in the U.S. alone, attend PLT workshops to learn how to use the program with young people.

Beginning in 1990, PLT undertook a multi-year curriculum revision program--to incorporate material on contemporary environmental challenges and to ensure that it maintains its position at the leading edge of environmental education. In planning the revision process, more than 50,000 teachers in the PLT network were asked how the program could be improved. The same question was asked to PLT leaders and national curriculum experts.

Recommendations from these groups underscored the tremendous scope and magnitude of the project. An entirely new curriculum would have to be created--from the conceptual framework to format and design. New topics and more background information for elementary teachers would be needed, and an entirely new approach for our middle and high school materials would have to be developed. The revision of the PLT curriculum was a slow and deliberate process. The development of models, outlines, and raw materials took place at regional writing workshops and revisions sessions around the country. The actual writing included numerous professionals, working closely with PLT's editorial staff and review committee.

Participation in the entire process was extraordinary. More than 2,000 educators and resource professionals responded to the revisions survey. More than 300 professionals took part in writing workshops and editing sessions. More than 300 educators participated in the pilot-test, field-test and formal evaluation of the new materials, conducted by the Research Commission of the North American Association for Environmental Education. The materials were reviewed by over 50 professionals, from scientific, natural resource, educational, and technical fields. The formal evaluation involved more than 3,000 students in 32 U.S. States and several Canadian Provinces. It included both traditional pre-test/intervention/post-test procedures as well as alternative assessment techniques. The results of this evaluation confirmed that the new PLT is an effective program for helping children become more environmentally literate young citizens. To our knowledge, PLT is the only program of its type to be subjected to such an extensive and intensive evaluation.

In developing assessment techniques we focused on the notion that more and more educators are using *authentic assessment* in their programs. Authentic assessment means designing evaluation to match the instructional goals. If the instructional goal is teaching about a plant's requirements, then the assessment should be caring for a plant rather than taking a multiple choice test. However, you cannot change assessment without changing instruction, and for many educators, this is a difficult transition.

What type of instruction supports authentic assessment? Since the purpose of authentic assessment is to assess *conceptual understanding*, instruction must emphasize the application of knowledge. Recent studies have shown that students develop new knowledge through *active construction*. This means they combine new information with pre-existing knowledge in an effort to *construct* meaning. The instructor should realize that students often have deep rooted misconceptions, and must be guided through discussion and new experiences toward achieving new conceptual understanding.

It has long been known that students are not empty vessels waiting to be filled; instead, students must actively participate in the teaching-learning process. Teaching for conceptual understanding often means covering less breadth and more depth. One way to make "less" go farther is to use *themes* to connect concepts and transcend traditional subject areas. Themes help students organize bits of previously disconnected knowledge and easily store and recall new information. For example, if we study our environment using the theme of "diversity," we may discover a diversity of biological characteristics among organisms, we may also find a diversity of social characteristics in a group of people.

Project Learning Tree's Pre K-8th Grade Activity Guide is arranged under five major themes: Diversity, Interrelationships, Systems, Structure and Scale, and Patterns of Change. Each theme covers the areas of Environment, Resource Management & Technology, and Society & Culture. Each theme integrates science, language arts, social studies, art, and physical education.

PLT is not designed to be an all-inclusive or comprehensive curriculum. Instead, teachers are invited to fill in the gaps they perceive in the program, with content that relates to their community, expertise, interests, or needs of their students.

Activities can be used individually to teach specific concepts or can be used with other activities as part of a conceptual storyline.

The activities reflect several methods of teaching environmental knowledge and values. Each activity attempts to guide the learner through the process of awareness, understanding, challenge, motivation, and action using active and hands-on experiences. Two of the most common strategies used in the activities are constructivist and whole language.

Constructivist--Recognizes that students construct new understandings by combining previous understandings with new discoveries. Learning specialists have found that students' preconceptions about the way the world works have a profound effect on their ability to integrate new scientific explanations of natural phenomena. With this in mind, teacher can guide students toward new discovery and scientific understanding by promoting critical thinking and creative problem solving.

Whole Language--Means to teach the "**whole**" rather than the "parts." This can be done by focusing on connecting themes, conceptual understandings, and critical thinking skills rather than transferring bits of information.

The PLT program employs several teaching strategies, including cooperative learning and problem solving:

Cooperative Learning--Organizes students into groups to cooperate in accomplishing academic and non-academic tasks while developing social skills.

Problem Solving--Promotes skills such as identifying problems, determining desired outcomes, selecting possible solutions, choosing strategies, testing solutions, evaluating outcomes, revising and repeating steps, and predicting new problems.

Environmental action is one of the most important components in this curriculum. When students work together on an action project, they develop a sense of belonging and self-esteem, and strengthen the feeling that they can make a positive change. Class projects such as adopting a tree, improving a school site, providing habitat for wildlife, and many others are outlined in the activities.

Using Environmental Education Teaching Strategies To Negotiate An Interagency Wetland Banking Agreement

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Intermountain Environmental Education Training Team (IEETT) members Al McGlinski, Dick McCloskey and Vern Fridley designed the Sawtooth Issues Workshop (SIW), now co-led by Rob Tiedemann, for professionals involved with environmental discussions, decision-making, and policy. Workshop participants facilitate discussions of controversial issues; guide audiences to higher levels of understanding and cooperation; effectively investigate natural environments and the social and political issues influencing their management; and, clarify personal environmental ethics while better understanding and accepting a diversity of values.

In 1991, Washington State Department of Transportation (WSDOT) officials realized a cooperative wetland banking agreement was needed which included an outline for the development and operation of the system. Adjacent states' transportation agencies had developed wetland banking agreements, accepted by resource and regulatory agencies, that resulted in cost effective mitigation. Collaborators included scientists and technicians knowledgeable about wetland mitigation issues, experts on law and policy, and managers. Skilled facilitators helped participants explore common ground leading to the formal agreement. Existing tools could aid development of a method to evaluate Washington's wetland functions and values, but WSDOT officials had not been successful in bringing agency representatives together for negotiations.

Methods

Pre-workshop interviews were conducted with 19 decision makers in seven state and federal agencies about: Why some wetland banking programs had not met expectations; opportunities for wetland banking in Washington; agency positions on wetland banking; essential elements of an agreement; personal concerns about wetland banking; past experiences with agencies that might hinder reaching consensus on an agreement; the process that might lead to an agreement; and commitments agencies would make to reach consensus. Interviewees were invited to attend wetland banking agreement workshops based on SIW techniques.

Workshops included activities for team building and differentiating individual natural resource values from agency positions. Group growth was analyzed using the sequence: inclusion, control, affection (Schutz, 1978). New participants were introduced using a Group Story Activity. Results of pre-workshop interviews were reviewed using cooperative learning/inclusion techniques and hands-on activities. Concepts were clarified using modified Project Wild and OBIS activities.

Results

Twenty-two individuals representing 12 government entities convened at the University of Washington's Pack Forest Camp for 12 two-day Wetland Banking Workshops. The agencies included: Army Corps of Engineers, Environmental Protection Agency, Fish and Wildlife Service, National Marine Fisheries Society, Federal Highway Administration, Northwest Indian Fisheries Commission, Puget Sound Water Quality Authority, and Washington State Departments of Ecology, Wildlife, Fisheries, Community Development, and Transportation.

Workshop ground rules, developed by participants, moved norms implicit within an individual's agency to an explicit level in our group. Awareness allowed the group to change norms hindering productivity and emphasize those increasing effectiveness.

Team building began with a small group problem-solving activity used at SIW. Individuals were given a piece of information necessary to solve a problem. Without participation from each group member, the problem cannot be solved. The objective was to develop cooperation and trust, while demonstrating the need for real rather than ritualistic listening, during problem solving.

Individual values and agency positions were differentiated using values clarification exercises. A forced-choice activity helped participants compare personal beliefs to agency positions about wetland management and demonstrate similarities and differences within the group. Personal roles in maintaining functions and values of wetlands were communicated during a values shield activity. Role playing helped participants understand how their agency was perceived by other professionals. Participants envisioned themselves as members of another agency participating in the workshop and provided their perception of that agency's role in maintaining wetlands. Discussion involved comparisons between the outsider's perception and those of the agency's real employees. False impressions were corrected and participants looked for grounds for agreement.

Essential elements of successful wetland compensation projects were elicited using a Wetland Building Block exercise. Participants divided into small groups which included practitioners (biologists, ecologists) and management personnel (policy analysts, planners, managers). Practitioners discussed elements of wetland projects, wrote short phrases describing each element, attached the notes to wooden blocks and arranged the blocks in the order that would allow the greatest chance for success. The management group listened and formulated questions to be asked after the practitioners finished. Discussion, following presentations of plans to the large group, concerned similarities and differences in elements needed for successful projects and agency policies or practices that promote or discourage their inclusion. Group consensus was reached about essential elements, issues, policies and practices that must be addressed in a banking agreement. The following issues emerged and were incorporated into a Wetland Compensation Activity:

1. Compliance with the mitigation sequence of avoiding, minimizing, and then compensating for impacts.
2. Protection and preservation of bank sites in perpetuity.
3. The geographic distance between banks and impacts.
4. Who should participate in the bank and for how long?
5. What should be the number, location, and size of the banking sites?
6. What should be the rules and requirements of the banking program?

A banking agreement draft was developed from the summary presentations of the Wetland Compensation Activity. Remaining workshops were spent formalizing the agreement.

Questions answered during negotiations included:

- What functions and values are provided by wetlands and affected by transportation facility construction and operation? What functions and values are not identified in the literature?
- How can existing tools be used to develop a unified methodology to identify and evaluate wetland functions and values? What additional information is needed to develop an evaluation method for transportation facility construction and operation?
- Which impacts must be assessed on a case-by-case basis and which can be assessed as a class of roadway activities?
- What model can be developed to determine appropriate mitigation, type and amount of restoration and enhancement required to mitigate, and the ratio of constructed to impacted wetlands when compensation is required?
- What quantitative methods can be used to account for impacts and mitigation by minimizing, restoring, enhancing, and compensating measures?
- What are the issues and concerns associated with banking?
- What are the essential elements of a banking agreement?
- What language best describes a wetland banking agreement?
- How will the agreement be implemented and success monitored?
- What commitments will agencies and organizations make to implement and maintain a banking program?

Tasks accomplished included:

- Strategies were developed to reach consensus among WSDOT, interest groups and resource and regulatory agencies on a *unified wetland evaluation method and a wetland banking agreement.*
- Wetland banking workshops were designed and facilitated.
- Consensus was reached on a *unified wetland evaluation method* and essential elements of a *wetland banking agreement.*
- A *wetland banking agreement* reflecting the consensus was developed.

Discussion

Time spent participating in hands-on educational activities, values clarification and team building during the workshops paid dividends. During the 18 month period, a group of agency representatives became a team determined to successfully complete the agreement. Group growth was monitored by changes in levels of inclusion, control, and affection.

Inclusion in the group was deemed to be adequate because attendance at meetings was high; members anticipated meetings and activities and arranged calendars to allow participation; individual needs and job demands were recognized and accepted; absent members were kept informed about what occurred and was planned; the group was committed and worked cooperatively to develop an agreement; good interaction and attention at meetings was evident; and all individuals were accepted, participated in discussions and contributed to the group.

Control within the group was deemed adequate because structure for controlling was not necessary; cooperation was high and individuals showed respect for each other; much bargaining took place; conflict was accepted and dealt with openly; the decision-making processes were clear; and the group was productive, followed through on decisions and accepted responsibility for its actions.

Affection was deemed adequate when it was observed that communication was open and honest; feelings were expressed and individuals accepted feedback; and individuals trusted and supported each other, were free to be different and were receptive to new ideas and change.

The banking team completed its task and Washington's first Comprehensive Wetland Banking Agreement is ready to be signed. During the process benefits accrued including: improved communication and understanding between the resource and regulatory agencies and interest groups; efficient evaluation of wetland qualities; determination of the most appropriate form of mitigation; improved conceptual and final design of mitigation measures; and improved accounting methods for wetland gains and losses.

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Author Identification Notes

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Tightening The Network in Maine--Collecting Life Stories

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Introduction

The purpose of this qualitative study was to investigate, through autobiographical accounts, the role of a selected group of nine Maine women who are currently involved in educating educators to become stewards of the natural environment. The need for this study is threefold. First, environmental education research to date has focused very little on life experiences of environmental educators. Secondly, gender differences and issues continue to be widely documented in the K-12 and higher education literature. There is also a vast and growing body of research on women's relationships with nature; women's ways of knowing; and women's moral thoughts and actions. (Anderson, 1991; Belenky, 1986; Gilligan, 1982, 1990; Griffin, 1978; Hynes, 1989; Keller, 1983; Merchant, 1980; 1989). Neither have been adequately explored in conjunction with women's roles in environmental education. Third, recording the views of those who are active in the field enables these messages to reach a wider audience now.

The work is intended to benefit three groups: the women participants themselves who offer the retrospective accounts of their lives; all those currently involved in planning, developing, and implementing gender sensitive environmental educational experiences; and young people who may consider the field as a profession.

Methodology

A sequenced recounting of events provides a context for understanding the meaning of women's lives in the field of environmental education, and therefore is a viable research tool. The approach draws out the experiences of the women in the profession, preserving their beliefs and language. (Gluck, 1991; Hoffman & Culley, 1985; Ives, 1980; Kotre, 1984; Lather, 1991; Thompson, 1988; Watson, 1985; Weiler, 1988).

Significantly, all the women invited to participate in this study consented to be interviewed; six were virtual strangers to me at the onset. Deriving feminist oral histories supports the educational philosophy which considers the integration of knowledge, feelings, and action. From an environmental perspective, the holistic orientation of life stories reveals the degree to which the women themselves engage in personal and global stewardship. This stewardship concept was set forth as one of four goals for educating students for the 21 century in Maine's Common Core Document which was disseminated to all schools in 1989.

A panel of environmental educators in the state was asked to identify women who fit the criteria of: residing in Maine, working with educators in outdoor settings, and sharing skills and information about the natural world. The participants were asked to recommend candidates for interviews. In the process of selection, I attempted to maximize the variation of typologies within the population of female environmental educators in Maine. All the women were white, ranging in age from early 30's to late 60's. They all identified themselves as being from middle class backgrounds.

Oral interviews of approximately two hours each were tape recorded and transcribed for analysis. An attempt was made to identify all areas of influence and subjectivity that I as the researcher brought to the study.

Descriptive profile of the women. Occupation for the women include:

- full time work for a State agency (Inland Fish and Wildlife), Private Foundations (Chewonki and Audubon Expedition Institute), a non-governmental organization (Maine Audubon); and a privately initiated and owned company (North Woods Ways); and

- part time and full time consulting work for federally and state funded educational programs.

All of the women have college degrees: three from University of Maine at Orono, two from Antioch College, and one from each of the following-College of the Atlantic, Smith College, San Diego State College, and South Dakota State University. Two have Master's degrees in environmental education, one from Lesley College and another from Antioch Graduate College. One has a Master's in Science Education from Northeastern University and a Certificate of Advanced Study from Harvard University in evaluation. One has an Ed.D. in Science Education from University of Maine at Orono. Eight have had teaching certificates at one time. Four actually worked in the public schools; two as high school biology teachers, one in early childhood and special education, and one as an environmental educator for a school district. All of the women have some formal schooling in one of the following related areas: ecology, biology, animal sciences, and/or natural history. Hierarchical career changes have not necessarily involved further formal education. Experience ranks high among the women and has opened doors for them in the profession.

Six of the women mentioned being married. Of those, four have children. One has decided not to have children. Two others related they are divorced. The three oldest of the group actively started their environmental education career after their children were in school. One is a young mother struggling to balance work and children.

The four youngest women, in their 30's and 40's, have been in the profession full-time since graduating from college. The woman who had worked the longest in the field, 20 years, now is employed full-time in another profession, doing environmental education on the side. Five of the women have worked the bulk of their environmental education career in Maine. All but one of the women are or have been active members in the Maine Environmental Education Association.

Three of the women have extensively been involved with hiring and supervising other environmental educators. Two offer formal training programs for volunteers. Five facilitate activities for school groups and their teachers. Two offer courses and trips which appeal to educators. Three others provide teacher workshops on a regular basis.

Results

Analysis for preliminary findings began with organizing dialogue from each interview into the following broad categories that formed the initial outline of questions. An abbreviated list of topics follows:

I. Becoming an Environmental Educator.

  A. Formative Experiences-people, places, events.
  B. Early Career Interests.
  C. Access to first environmental education job.
  D. Early training/experiences.

II. Career changes-lateral and/or hierarchical.

III. Characteristics of Current Job.

  A. Induction.
  B. Responsibilities.
  C. Visions.
  D. Criteria for satisfaction.

IV. Belief and Practice in Networking and Need for Autonomy.

V. Mentoring

  A. Identification and description of mentors.
  B. Acting as a role model for others.

VI. Working with Prospective/Practicing Educators.

VII. Philosophy of Environmental Education.

  A. Definition.
  B. Uniqueness of practicing in the State of Maine.
  C. Identification of influential literature, programs, and/or educators.

VIII. Sensitivity to Gender Issues in the field.

Analysis for building theory follows the model developed by Strauss & Corbin, 1990. Their systematic coding procedure involves naming categories of experiences. These categories are compared amongst interviewees. Finally, a central theme is constructed around which the other categories can be explained.

Discussion

A central theme emerging from the autobiographical accounts is the strong sense of commitment the women feel to the profession. They speak about their work using strong, positive, and emotive language.

The following problems represent the difficulty of being an environmental educator: few full-time opportunities for work, limitations because of family commitment; lack of funding particularly in the 1980's; seasonal nature of working/living outdoors; poor benefits from working part time or being self employed; and low pay for educational work. As a result of encountering these obstacles, the women characterize themselves as being persistent and dedicated to the field. They've made financial compromises in their choice of work.

Economic issues were never mentioned as the sole criteria in choosing a particular job in environmental education. Lack of challenge was cited as a primary reason for seeking a new opportunity. There is nothing passive or complacent in how these women have come to lead lives as environmental educators.

All of the women shared examples of taking initiative and having autonomy in their work. On the other hand, everyone viewed networking in a positive light. Some expressed need for solitary, reflective time for creative construction of new curricular activities.

All spoke of valuing time spent outdoors. All have been involved in taking people on exploratory, nature study field trips. These excursions take many forms and involve homogeneous and heterogeneous age groups. The women's collective efforts have helped ensure that citizens don't become detached from nature. For these women, environmental issues are not abstract, distant problems of other communities. They emphasize becoming involved with the 'local' woods over learning about rain forests. These educators all promote an element of bioregionalism- knowing something about one's natural surroundings through experiential learning.

For all of these women, their own frequent access as children to the outdoor world was viewed as formative in shaping their present day environmental ethic. They in turn like sharing their skills and knowledge about the outdoor world with others to engender respect. There is a sense of generativity in their actions.

As the preliminary findings reveal, many of the topics covered in the interviews relate to the core idea that it is not easy for the women to make a living as environmental educators, however, the rewards of the profession are great.

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A Model of Affective Learning in Nonformal Educational Settings

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Introduction

Museums, science centers, parks, nature centers, zoos, historic sites--all of these are settings where nonformal environmental education, also known as interpretation, can occur. These settings can be effective in promoting cognitive learning and affective learning. However, there is both professional opinion and empirical research which suggest that the major advantages of learning activities in nonformal settings over those in formal settings may lie in the affective domain (Koran & Baker, 1979; Flexner & Borun, 1984).

Roberts (1990) has written, "The role of affective modes of knowing in learning processes remains an elusive, fragmented area of study. Not only does research cross many disciplinary boundaries, but language about affect changes from one individual to the next" (p. 19). If a strength of nonformal education is to facilitate affective learning gains, a better understanding of affect as it relates to learning in nonformal educational settings is clearly needed. The purpose of this research was to develop a model of affective learning in nonformal educational settings which can serve as a conceptual framework for further research in this area.

Research Design

A method of hypothesis formulation known as analytic induction was employed to synthesize a heuristic model of affective processes in nonformal educational settings, such as zoos, parks, and museums. The research was conducted in stages, as follows:

1. A literature review from disciplines such as psychology, education, interpretation, museum studies, visitor behavior, leisure studies, and related areas was performed.

2. Drawing from the reviewed literature, a model of affective response specifically applicable to nonformal educational settings (Model 1) was synthesized.

3. Field research, consisting of solicitation of review comments from a panel of expert researchers, in-depth interviews with practitioners of nonformal education, and observations of learners in nonformal educational settings, was conducted to scrutinize Model 1.

4. Model 1 was revised in light of the data collected during the field research (Stage 3), resulting in Model 2.

5. Model 2 was subjected to review by the participants from the field research.

6. Model 2 was further revised using feedback obtained in Stage 5, resulting in the Final Model.

7. Based on the Final Model, a description of the affective processes relating to nonformal environmental education was formulated.

The Model

The Final Model displays a sequence of events occurring in the affective response in nonformal educational settings, and identifies factors influencing individual elements within this sequence. The Model is proposed as a conceptual framework for describing the affective process in nonformal education, for making limited recommendations for standards for practice in nonformal education, and for making recommendations for further research.

Recommendations for Standards for Practice

Because of the heuristic nature of the Model developed in this study, any recommendations for the practice of nonformal environmental education based upon the Model must be considered somewhat tentative. Some limited recommendations for practice follow:

1. Remember that each learner forms and responds to an individualized mental picture of the exhibit or program. Factors such as differences in sensory capabilities, preferences for certain sensory modes, satiation and fatigue, motivational state, and social and cultural factors will affect the formation of this mental picture.

2. The Model suggests that motivational state is crucial to every stage of the affective process, and the satisfaction or frustration of the visitor's motivation(s) is a main determinant of the quality of that affective experience. Thus, developing visitor profiles which identify the true motivations of visitors, in addition to more traditional demographic data, could help educators structure programs that would be more satisfying to larger numbers of visitors.

3. A dominant pattern emerging from the field research component of the study was that social interactions seem to be crucial to the nonformal educational experience. Nonformal educators should consider structuring programs to provide learning experiences that maximize social interactions within groups in a meaningful way.

Recommendations for Research

Based on the Final Model developed here, the following recommendations for further research are proposed:

1. Both the literature and the field research component of this study indicated an ambiguity of terminology associated with affective constructs. For example, practitioners interviewed made little apparent discrimination between the phenomena of interest, curiosity, attention, and enjoyment until probe questions were pursued. A clarification and standardization of terminology used to identify affective phenomena and the development of more discriminatory methods for evaluating and/or operationalizing these phenomena is needed.

2. The Model enumerates factors which are hypothesized to influence various subphenomena within the affective process in nonformal educational settings. More research is needed to support and expand upon existing evidence for the influence of these factors. Research should also be pursued to determine if some factors are more influential than others.

3. Research is needed to clarify how the affective experiences of learners in nonformal educational settings might be enhanced.

4. Research is needed to identify the long-term effects of affective processes in nonformal educational settings. Such research would be useful in justifying the need for nonformal programming.

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The World Plan for Environmental Education

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1. Estrategias de Educación Ambiental Para Cualquier País Del Mundo

Introducción

Antes de abordar aspectos concretos sobre esta materia, debemos tener claros algunos conceptos básicos que nos ayudarán a fijar los objetivos y a establecer mejor las estrategias. Es por esto que comenzaremos definiendo Ambiente y Educación Ambiental.

El AMBIENTE, es la conjugación de elementos biológicos, químicos, físicos y socio-culturales, que interactan sobre cada organismo definiendo su vida; vale decir entonces, que es un todo integral, cuyos elementos se combinan interdependientemente.

La Educación Ambiental, es un proceso de formación para adquirir nociones básicas sobre las características y necesidades del entorno y así poder asumir con mayor seguridad acciones dirigidas a su preservación y mejoramiento.

Todo conocimiento debe ser reforzado con acciones concretas. No basta con saber los problemas de una localidad, es necesario conocer sus orígenes, causas y efectos, para poder identificar los recursos y métodos que se requieren para sus tratamientos.

Todo propósito de enseñanza-aprendizaje en materia ambiental debe partir de dichos conceptos, pero debe tener como base el diagnóstico actualizado de la realidad del entorno, para poder aplicar las estrategias metodológicas del caso.

De esto se deduce, que las estrategias generales pueden ser adaptadas a diferentes situaciones, pero tienen que ser ajustadas a las características del lugar donde serán aplicadas.

EVOLUCION

Es necesario informar, que 12 años antes de la Cumbre de la Tierra, La Federación de Organizaciones y Juntas Ambientalistas de Venezuela: "FORJA", propuso al gobierno venezolano un Plan Nacional para la Educación Ambiental, pero fue en 1989 cuando se inició la aplicación de esta propuesta, que fue transformada en un Programa Mundial, al que sumaron otras ideas presentadas durante la Tercera y Cuarta Reuniones Preparatories de la UNCED (Ginebra y Nueva York), que fueron condensadas en el Capitulo 36 de la Agenda 21, aprobado en Rio sin las consultas necesarias.

Esta iniciativa de "FORJA" ha sido enriquecida gradualmente, pero todavia las authoridades nacionales, regionales y municipales no han asumido este Plan con suficiente fuerza. No obstante, esta Federación Nacional de ONGAS elaboró una estrategia global para lograr la aplicación integral de este plan, que es fácil de adaptar en cualquier otro país.

ESTRATEGIAS NACIONALES DE PARTICIPACION CIUDADANA

1. Creación del Consejo Nacional para la Educación Ambiental (CONEA), formado por Miembros de los Organismos Gubernamentales que planifican y aplican las politicas educativas y ambientales, así como por Representantes de los Medios de Comunicación Social, del Consejo Nacional de Universidades, y una justa representación de las Organizaciones No Gubernamentales Ambientalistas (ONGAs).

Las funciones del CONEA están fijadas en el Plan Nacional para la Educación Ambiental, con las siguientes estrategias:

(a) Analizar y evaluar la aplicación de los contenidos ambientales de diseños curriculares escolares y extraescolares.
(b) Establecer formas para sincronizer y coordinar los programas formales y no formales de educación ambiental.
(c) Hacer talleres de capacitación y evaluación para educadores de los diferentes niveles.
(d) Realizar conferencias, cursos, foros y charlas para la concientización, capacitación y organización de la ciudadania.
(e) Llevar record de las mas acciones ambientales para proponer los reconocimientos públicos a que haya lugar.
(f) Promover las actividades preparatorias y apoyar la creación de Organizaciones No Gubernamentales Ambientalistas.
(g) Ayudar a formar y respaldar Centros Regionales de Información y Documentación.
(h) Planificar y coordinar los programas para celebrar el Dia Mundial de la Tierra, del Ambiente y del Habitat.
(i) Programar y coordinar conjuntamente con los medios de comunicación, campañas permanentes para la concientización y participación, organizada de los ciudadanos en asuntos ambientales.
(j) Emprender acciones para que las personas asuman "in situ" la clasificación y reciclaje de los desechos que generan.
(k) Asesorar en Educación Ambiental a las Gobernaciones, Alcaldías, Consejos Municipales y Asociaciones Comunitarias.

2. Constitución de la Comisión Regional para la Educación Ambiental en cada Estado o Provincia del país, con una estructura más horizontal, donde además de los Organismos acreditados en El CONEA, también estén Representantes de Institutos de Educación Superior, de la Gobernación y de los Organismos Regionales de Residuous Sólidos, Aquas, Parques, Recreación, Gremios y otras.

Estas Comisiones son una derivación del CONEA, pero sus funciones están concentradas en el respectivo Plan Regional.

3. Los Comités Municipales para la Educación Ambiental, que son una consecuencia de las Comisiones Regionales. Están formados por Representatantes Gubernamentales y No Gubernamentales que trabajan en programas de Educación Ambiental. Sus funciones específicas están establecidas con base a su territorialidad.

4. Estos 3 organismos Interinstitucionales están vinculados a las Organizaciones Escolares Ambientalistas y Sociedades de Padres y Representantes de los Centros Educativos. También tienen relaciones con Asociaciones de Base No Gubernamentales, como:

(a) Las Asociaciones de Vecinos, de Propietarios, Grupos Ecológicos y otras, que son responsables de recibir y tramitar la solución de los problemas de las comunidades locales.
(b) Las Juntas Ambientalistas Municipales y Parroquiales que agrupan a las Asociaciones locales, enlazándolas con los organismos de toma de decisiones.
(c) Las Sociedades Conservacionistas, Ambientalistas o Ecológicas de cada Estado o Provincia.
(d) La Federación de Organizaciones No Gubernamentales Ambientalistas, que es la expresión nacional de las asociaciones regionales, municipales y locales; además de conocer, investigar, analizar, procesar y evaluar los problemas ambientales. También planifica y realiza programas no formales de educación ambiental, coordinados en el proyecto central del Movimiento Ambientalista, denominado Universidad Popular Ambiental: "UPA".

En Venezuela este grupo de estrategias están teóricamente bien definidas, pero su aplicación avanza lentamente por la falta de apoyo oficial y las limitaciones financieras de "FORJA", pero estos primeros resultados garantizan los éxitos en el futuro.

ESTRATEGIAS ESPECIFICAS DE FORMACION AMBIENTAL

Los conceptos y principios básicos de Educación están unidos a la problemática ambiental y a los procedimientos para su tratamiento. De allí, que tanto en niveles formales como en no formales deben combinarse ambas cuestiones.

ESTRATEGIAS FORMALES

En Venezuela, los contenidos ambientales están incorporados a los diferentes niveles escolares. Este es un importante paso que debe ser evaluado y periodicamente a través de:

(a) Encuestas con los alumnos para verificar los grados de motivación, aprendizajes y obstáculos del proceso.
(b) Encuestas a educadores y supervisores para definir niveles de capacitatión, interés, motivación, deficiencias curriculares, limitaciones y necesidades de actualización.
(c) Talleres periódicos para evaluar y actualizar los diseños curriculares.
(d) Seminarios-talleres para verificar las deficiencias de los educadores y supervisores, y nivelar su capacitación.
(e) Entrevistas con los Supervisores para resolver las necesidades de control, evaluación y apoyo interno.
(f) Revisión y mejoramiento de los sistemas de apoyo.

ESTRATEGIAS NO FORMALES

La inter-relación de las Organizaciones No Gubernamentales (ONGs) con los Medios de Comunicación Social y los Organismos Gubernamentales encargados de políticas educativas y ambientales, es muy importante para alcanzar resultados mas positivos. De acuerdo con esto hay que cumplir con las siguientes tareas:

(a) Estimular la integración de los programas educativos de las "ONGAS", a través de una Unidad Operativa Nacional, capáz de concentrar, difundir y multiplicar los esfuerzos creativos.
(b) Acordar planes conjuntos entre las "ONGAs" y los Organismos Gubernamentales encargados de la Educación Ambiental.
(c) Convenir acuerdos con los medios de comunicación, para apoyar y reforzar las acciones escolares y extraescolares.
(d) Establecer medios de control y mejoramiento sobre el código de ética de los medios de comunicación social.

ESTRATEGIAS COMUNES

Cualquier sea el camino, el nivel y los medios usados, las acciones de educación ambiental deben ir dirigidas a promover y apoyar la participación organizada de las comunidades. De acuerdo con esto, todo programa educativo debe tocar de alguna forma, los diferentes tópicos ambientales, fijando adecuada relación entre los procesos de participación comunitaria, legislación ambiental y procedimientos administrativos para tratamiento de problemas.

En cada nivel educativo, además de los Recursos Naturales Bióticos y Abióticos, deben ser tratados los siguienters tópicos:

1) AREAS PROTEGIDAS, con énfasis sobre concepto, razón uso, vigilancia, control y administración auto-sostenida de: Reservas de Biósfera, Parques Nacionales, Monumentos Naturales, Zonas Protectoras, Areas de Reserva Hidrológica, de Flora y Fauna.

2) BIODIVERSIDAD, tema está totalmente unido a las Areas Protegidas ya citadas, pero la mayor base de sustentación son los Bosques Tropicales, sobre todo el poder farmacológico, forestal, oxigendador, hídrico y climatológico que recibe la tierra a través de LA AMAZONIA, selva tropical muy frágil que han estado devastando fuertemente. Este tópico obliga a tener que conocer el contenido de la Convención sobre Biodiversidad y el Programa de Biotecnología, aprobados en la CNUMAD a UNCED, realizada en Rio de Janeiro en junio 92.

3) CAMBIOS CLIMATICOS. Los aumentos de temperatura generados por el uso irracional de energías fósiles, deforestaciones e incendios forestales, etc., que afectan gradualmente al planeta y amenazan la vida, tienen que ser vinculados a la Convención de Cambios Climáticos, aprobada también en la Cumbre de la Tierra.

4) EL PROTOCOLO DE MONTREAL que establece la eliminación de las Sustancias que Afectan la capa de OZONO (SAO), como Cloro-Fluoro-Carbonos (CFCs), Halones, etc.

5) FUENTES DE RESIDUOS SOLIDOS: La recolección, transporte y tratamiento final de los residuos sólidos, con énfasis sobre su clasificación en los sitios de origen y el uso de transportación segura y de tecnologías limpias para su tratamiento definitivo, profundizando sobre el RECICLAJE INTEGRAL de todos los desechos.

6) LAS AGUAS NEGRAS O SERVIDAS: vertidos domiciliarios vs. descargas industriales, con análisis crítico sobre las graves consecuencias que están generando sobre cuerpos y espejos de aqua.

7) Origenes, causas, efectos y tratamiento de todos los TIPOS DE CONTAMINACION:

    a) Localización y funcionamineto de Centros Industriales
    b) Parque automotor: emisión de gases, ruidos y grasas
    c) Agroquímicos: efectos sobre el suelo, aqua y humanos
    d) Desechos tóxicos o peligrosos
    e) Explotación minera
    f) Explotación de hidrocarburos, producción de derivados
    g) Contaminación: sónica, visual y mental

8) PLANIFICACION Y ORDENACION TERRITORIAL Y URBANISTICA: En este tópico deben ser tratadas los técnicas para la elaboración, consulta y evaluación de los respectivos Planes.

9) CENTROS RECREACIONALES: Necesidades, uso y mantenimiento de los parques, playas y otros lugares de esparcimiento social.

10) SERVICIOS PUBLICOS BASICOS: Es muy importante que todo ciudadano, desde el inicio de su formación, aprenda a conocer y a evaluar el funcionamiento de sus centros de salud, sistemas de distribución de aqua potable, recolección y tratamiento de aquas servidas,

suministros de alimentos, sistemas de transporte colectivo y otros servicios fundamentales para su nivel de vida.

11) PROCEDIMIENTOS ADMINISTRATIVOS Y ESTUDIOS DE IMPACTO AMBIENTAL: Es útil que las personas conozcan las gestiones, que sobre PERMISOLOGIA deben realizar los interesados en desarrollar toda obra, pública o privada, como también las instancias donde deben acudir para solicitar información y presenter denuncias sobre dudas o irregularidades observadas. Igualmente es conveniente que conozcan igualmente, todo lo relativo a la elaboración, presentación y seguimiento de los ESTUDIOS DE IMPACTO AMBIENTAL, que deben ser consignados para obtener los permisos finales y poder desarrollar una obra determinada.

12) LA LEGISLACION AMBIENTAL: Es la harramienta de trabajo que más debe utilizar un ciudadano para comprehender, defender y mejorar su entorno. De allí, que el Compendio Jurídico Ambiental debe ser profundizado en atención al nivel escolar u ocupacional, pero más a las características locales, para conocer y aplicar mejor la jerarquía de las normas, de acuerdo con su tipo y en base a la vinculación con el respectivo ámbito territorial.

13) LA DECLARACION DE RIO (CARTA DE LA TIERRA), LA AGENDA (PROGRAM XXI), LOS TRATADOS DE ONGs y los otros documentos firmados en la Conferencia Mundial sobre "AMBIENTE Y DESARROLLO" (UNCED o CNUMAD), deben ser asimilados por cada uno los diseños curriculares de los distintos niveles escolares y por todos los programas no formales de Educación ambiental, porque son los más importantes documentos asumidos por las Naciones Unidas para tratar de enfrentar la crisis planetaria.

Estos Documentos deben ser muy difundidos y analizados de acuerdo con los correspondientes niveles de capacidades. En esa dirección hay que hacer énfasis en los 40 Capítulos producidos durante las 4 Reuniones Preparatorias de la Cumbre de la Tierra y que en su conjunto son conocidos como AGENDA XXI.

A pesar de algunas faltas que presentan, estos 40 programas son muy importantes y si pudieran ser combinados con los 43 Tratados de ONGs que fueron aprobados en Rio durante el FORO GLOBAL '92, serán instrumentos determinantes para lograr el Desarrollo Ambientalmente Sustentado, que tanto han ponderado en estas últimas décadas, con otras denominaciones.

CONCLUSION

La applicación y evaluación de estas ESTRATEGIAS, está supeditada a la combinación de esfuerzos entre los sectores participantes, pero sobre todo a los niveles de compromiso y al apoyo financiero y comunicacional que necesitan.

En base a esto, los organismos gubernamentales tienen que entender, apoyar y respetar las funciones que realizan las ONGs, pero a la vez es necesario que las ONGs hagan más amplios y democráticos los canales de participación que dirigen.

Evaluation of the Long Term Effects of a National EE Curriculum

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In 1991, the Energy Source Education Council funded an independent study of the long-term effects of classroom instruction using the Energy Source Education Program, a set of instructional units developed and sponsored by the council. The study involved measurement of the knowledge about energy, attitudes toward it, and energy-conservation behaviors of 1,349 sixth-grade students who previously had received instruction with zero to four Energy Source units. This paper summarizes the procedures and results from the study, which took place during the 1991-92 school year.

The study was commissioned by the council to extend its evaluation of the Energy Source units by measuring their long-term effects. The immediate effectiveness of the units in producing learning gains has been well established through the test data from field testing and from regular classroom use since 1982. But do these gains persist over a period of years or are they only temporary? This question was the central issue addressed in the study.

The study involved the evaluation of eight instructional units on energy. All eight units were developed by the same curriculum development agency for the Energy Source Education Council or for individual companies that are members of the council. The units were designed for specific grade levels from kindergarten through grade 6.

Each unit was designed to be taught by the regular classroom teacher over a two- to three-week period on a lesson-a-day basis. Each unit addresses a particular energy content theme and also emphasizes energy conservation. The materials for a unit include a teacher guide, a student booklet for each student, an audio cassette and filmstrip or videotape, a home activity booklet, a poster, and a pre-test and post-test. Each unit was field tested in several classrooms during its development to ensure that students learned well from it and that students and teachers liked it.

Table 1 lists the name, grade level, and content theme of each of the eight instructional units. Each unit is used at a particular grade level to provide instruction on one or more energy topics. Collectively, the units comprise a comprehensive energy curriculum for the elementary schools.

Table 1
Instructional Units on Energy Assessed in the Study

Grade(s)	Designated (in addition to conservation)	Major Content Theme Unit
Offalot	K	How energy is used; energy safety
Brightland	1-2	How energy is distributed in the community; how energy produces heat, light, or motion
Captain Power	1-2	How we use energy in the home; what it costs
Fossil Fuel Junction	3-4	How fossil fuels are used to produce energy and other products
Great Hot-Air Balloon Race	4-5	Heat energy; how we insulate with buildings and clothing
Safety Sleuth	4-5	Energy safety
Power Quiz	5-6	Energy sources, uses and costs
Power Switch	5-6	Past, present and future energy sources

The standard distribution method for the units is that they are purchased by member companies of the Energy Source Education Council and made available to schools free of charge. The average cost of a unit is about $1.50 per student.

An evaluation instrument, The Energy Biographer, was a 119-item assessment device constructed specifically for this study. The instrument, which was administered to students by their classroom teacher, contained sections assessing students' knowledge of the energy content taught in the eight instructional units, their interest in energy, and their self-reported energy conservation behaviors. Several test items from a national measure of energy knowledge, the 1990 NEED Energy Education Poll, were also included to determine whether participation in the Energy Source units affected knowledge assessed on a national measure not affiliated with Energy Source.

The participants were 1,349 grade 6 students from a total of 15 schools in Minnesota and San Diego, California. Each school had been offered use of selected Energy Source units for the past seven years, thus covering the K-6 grade range for the current grade 6 students. Teachers administered The Energy Biographer to students in the spring of 1992.

The initial set of items on The Energy Biographer was designed to identify which of the eight instructional units each student had participated in during grades K-6. Table 2 shows the number of students who participated in zero, one, two, three, and four units, and the mean percentage scores of the different test sections for these students. The table reveals that a total of 758 on the 1,349 students in the study (56 percent) remembered participating in one or more of the Energy Source units and that 591 students (44 percent) did not feel they had participated in any of the units. The average number of units participated in by the 758 students who had at least one unit was 1.75.

Table 2
Mean Percentage Scores by Number of Units Studied*

No. of Units Studied	No. of Students	Percent of Sample	Energy Source Knowledge (62 Items)	Need (4 Items)	Conservation (9 Items)	Interest (2 Items)
None	591	44	49	28	56	43
One	389	29	54	28	58	47
Two	194	14	59	30	57	47
Three	121	9	62	35	62	51
Four	**54	3	64	32	63	55
	1,349	100	53	29	57	46

*The differences reported on each measure across the units-completed groups were evaluated via a one-way analysis of variance (ANOVA) statistical procedure. All these differences were significant. ($P<.05$)

**Five of the 54 students in this group participated in five units.

The data in Table 2 show a consistent pattern, with minor exceptions, for scores to increase on each test section as the number of units increases. The average score on the 62 Energy Source knowledge items was 49 percent for students who did not participate in any units and 64 percent for those who participated in four units. For the NEED section, the average score increased from 28 percent for no units to 35 percent for three units, then declined to 32 percent for four units. Average scores increased from 56 percent for zero units to 63 percent for four units for conservation behaviors, and from 43 percent for zero units to 55 percent for four units for interest in energy.

The average scores for four units generally represent sizable increases over the zero-unit scores. The four-unit mean of 64 percent for the Energy Source items is a 31 percent increase over the zero-unit mean of 49 percent. Comparable increases from zero to four units for the other measures were 14 percent for NEED items, 12 percent for conservation behaviors, and 28 percent for interest in energy.

Figure 1 illustrates the relationship between participating in different numbers of units studied (no units, 1 or 2 units, 3 or 4 units) and scores on test items from each Energy Source unit. The general pattern revealed in the figure is that scores on the items from each unit increase as the number of units increases. The increase in test scores for Energy Source units as the number of units increases is the same pattern that occurred across all four test sections (Energy Source, NEED, Conservation, Interest) as shown in Table 2.

Several items were selected from different sections of *The Energy Biographer* because student responses to these items indicate the effects of multiple Energy Source units on student behaviors, attitudes, and knowledge. Student responses to these items are shown in Figure 2.

Figure 1: Mean Percentage Scores by Unit and Numbers of Units Studied

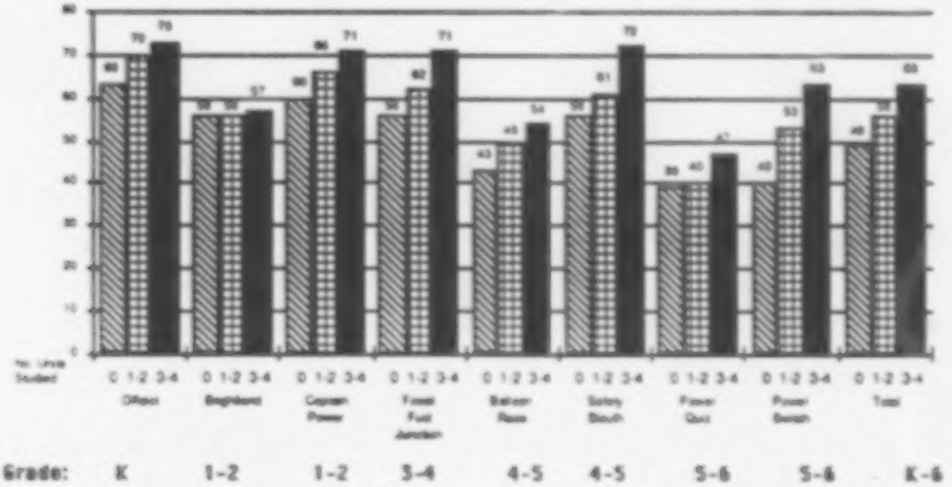

Figure 2: Student Responses to Selected Items on Energy Conservation Interest, and Source of Information

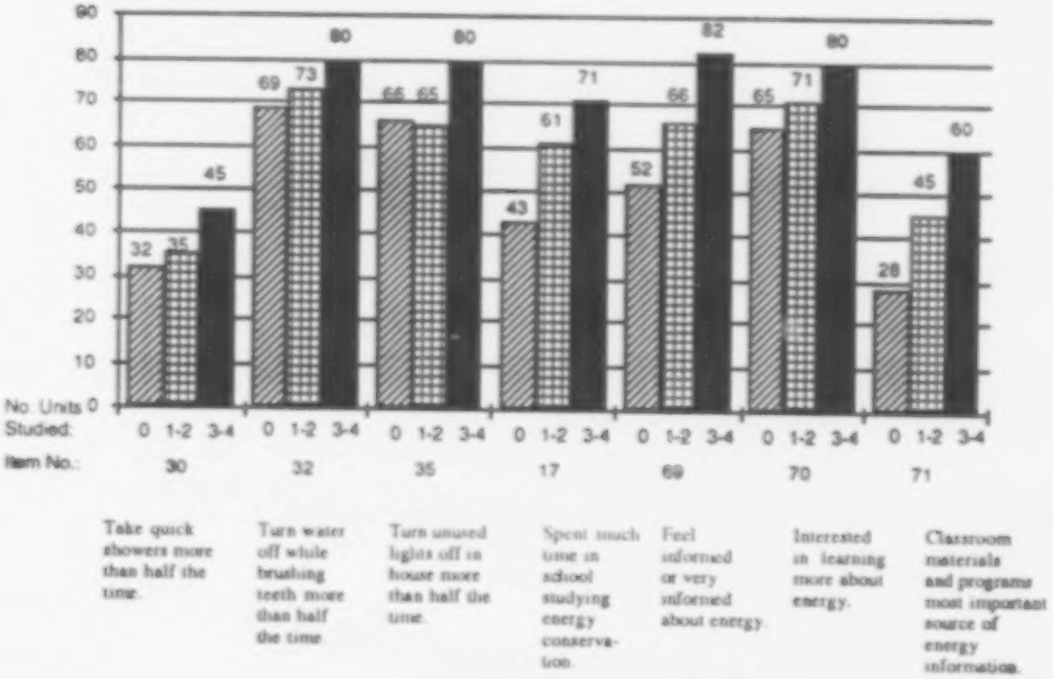

Figure 2 reflects the pattern noted earlier that student scores increase as the number of units increase. Energy conservation items in the figure reveal that, when compared with students who had no units, more students who had three or four units report that they take quick showers (45 percent to 32 percent), turn the water off while brushing their teeth (80 percent to 69 percent), and turn off unused lights (80 percent to 66 percent) more than half the time. These figures represent increases for three-to-four units over no units of 41 percent for quick showers, 16 percent for turning off water while brushing teeth, and 21 percent for turning off unused lights.

Other data in Figure 2 show that more three-or-four-unit students than no-unit students feel they spent much time in school studying energy conservation (71 percent to 43 percent), feel informed about energy (82 percent to 52 percent) and are interested in learning more about energy (80 percent to 65 percent). In addition, 60 percent of the three-or-four-unit students reported that classroom materials are their most important source of energy information (when contrasted with newspapers, television, families, etc.), compared to only 28 percent of the students who had no Energy Source units.

The results of this study reveal that students who participated in one or more Energy Source units know more about energy, have a greater interest in it, and have better energy conservation habits. Their better conservation habits should yield direct energy savings that quickly exceed the cost of the units.

The data also reveal a cumulative effect from use of higher numbers of Energy Source units. The more units students had, the higher their scores. This pattern occurred consistently across the energy knowledge, energy interest, and energy conservation test sections.

Transactive Planning--A Holistic Approach for Environmental Education

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The theory of transactive planning, developed by John Friedmann (1973), is based on the concept of an active society. An active society is one that is capable of learning about itself and utilizing that knowledge to effectively guide its own development. Achieving an active society is the end product in a series of factors. The first factor is dialogue or face to face communication which prompts an exchange of information and ideas among the learning group. This exchange leads to the second factor, mutual learning, whereby participants are learning *from each other*. Lastly, societal learning transpires when society is able to transform knowledge into a consensus of community action (Friedmann, 1973). The application of this theory as a tool for environmental education is the focus of this paper.

Applications of transactive planning have dealt mostly with natural resource issues and conflicts pertaining to management decisions. Participants encompass a diverse array of opinions, thus adding the crucial component--*diverse knowledge*.

In prompting the act of dialogue one must first be *authentic*. To be authentic means to discover yourself through dialogue, while others are discovering themselves as well. Just as in life planning where one undergoes an identity crisis which results in the reexamination of one's basic values and assumptions, the same holds true in transactive planning. The difference here is self discovery is prompted through dialogue with another individual (Friedmann, 1973).

While engaged in dialogue, transactive planning requires one to be *open*. In order to accept the person who differs from you means opening yourself to that person. It requires an openness that validates the differences in the other being. Dialogue creates the avenue of freedom for acceptance of another, as the person has chosen to be. When we are able to accept a person different from ourselves without feeling threatened, we have increased our understanding of ourselves and others (Friedmann, 1973).

Conflict is an inevitable part of the dialogue process, not its termination. It is precisely from people's differences that conflict arises and is the sole reason for dialogue in the first place. Conflict may also arise due to an inability to clearly state your meaning within the context of the other person's perceptions and feelings. Resolution can take place if there is an alliance of shared interests and commitments. It must be relevant to a particular condition of each participant's life, otherwise people will not be involved in the process. All players must share some *common thread* in order to perpetuate dialogue (Friedman, 1973).

Mutual learning acts as a measure of successful dialogue. At the point when diverse fields and backgrounds of knowledge are effectively combined in a joint exploration of problems and possible solutions, mutual learning has occurred. One of the crucial components of transactive planning is the coalescence of diverse knowledge on an holistic spectrum. If mutual learning is effective, then societal learning as a whole transforms this knowledge into community action to guide and develop its environment (Friedmann, 1973).

The theory of transactive planning is applied in various planning frameworks. The authors have utilized this theory in the Limits of Acceptable Change (LAC) System for Wilderness Planning, developed and employed by the USDA Forest Service (Stankey, Cole, Lucas, Peterson, and Frissell, 1985). Comprising a series of nine steps, the LAC requires managers "... to define desired wilderness conditions and to undertake actions to maintain or achieve these conditions" (Stankey, et al. 1985). Throughout the entire planning process, public and special interest groups as well as agency personnel are all part of the planning team, creating a diverse assemblage of knowledge.

Initially applied in 1985 at the Bob Marshall Wilderness complex (BMWC) in Montana (Ashor, 1985), the Limits of Acceptable Change is now considered the chosen wilderness planning process by the USDA Forest Service. Due to increased public participation and vocalization pertaining to planning and management of natural resources, agency personnel maintain the concept of "consultative management" (Tipple 1989).

In East Texas, wilderness areas are characterized by intense debates involving local landowners, environmental groups and the USDA Forest Service over such issues as Southern Pine Beetle, wild and prescribed fire, and mineral rights. Three months after our first Limits of Acceptable Change meeting a questionnaire was administered assessing the effectiveness of the planning process thus far. The purpose was to measure elements indicative of transactive planning. We found that, indeed, mutual learning is occurring, that citizen concerns are being incorporated into the plan and that the process is responsive, taking into account specialized interests, needs and values (Table 1).

Table 1
Initial Questionnaire Assessing the Effectiveness of Transactive Planning

		Strongly Agree	Agree	Neither Agree or Disagree	Disagree	Strongly Disagree
Mutual Learning has occurred among LAC participants.	Agency Citizen	2 0	3 5	0 0	0 0	0 0
The concerns of the citizens have been effectively incorporated into the plan thus far.	Agency Citizen	5 1	0 3	0 1	0 0	0 0
The planning process thus far has been responsive and has taken into account specialized interests, needs and values.	Agency Citizen	2 0	2 4	1 1	0 0	0 0

Although transactive planning has not been directly applied in environmental education (EE), similar approaches are already in place. A useful example is experiential education in adventure programming.

Participants in these programs typically are involved in new, sometimes remote settings, where the emphasis is "learning by doing" (Miles and Priest, 1990). This type of framework is similar to transactive planning due to the fact that learning is participatory and discussion is guided through facilitation. While adventure experiences supply a legitimate need in our society, transactional planning is more flexible in its approach, filling voids produced by different styles of learning. As an holistic approach to environmental education, transactional planning focuses on each student, stressing the individual as an integral component of the whole class. The class no longer consists of a dichotomy of vocal vs. passive students but rather an "egality"--where the group supports equal political and veto power for all participants. Agreement is not based on majority rule, but rather consensus with varying degrees of accord.

In order to prevent collision among students' ideas and dialogue, the instructor serves as facilitator, guiding discussion and focusing ideas. An example of transactive planning as an environmental education tool is described below:

> The instructor presents an issue to the class. The issue may encompass anything, but it must be applicable to the region and relevant to the age group at hand. For this example we'll use a shopping mall in a small Texas town. A developer is proposing to build a super mall in a 10 acre wooded lot, a popular area for nature-based activities. The proposed site is also the site of a significant historical event in the state of Texas. A stream meanders through the center of the 10 acre area, frequently flooding after heavy rains. Deer Park already has an old shopping mall 2 blocks away but the new one will be bigger with cheaper prices and a better selection. As Deer Park residents, the class works to communicate their ideas and visions of what the future of Deer Park will be. As facilitator, the instructor presents the issue and, preferably, a field trip to the site. Discussing among themselves, classmates exchange their thoughts on the issue. The instructor (facilitator) gathers the shared interest of the town people and the objectives for the town, (this is delineated from the group discussion). Discussion is not directed toward the instructor but rather among the classmates themselves. Once the group has a common goal and shared objectives they can begin to work towards solutions.

Goals and objectives are based on group consensus with every member easily supporting the decision. If one member of the group disagrees, the group must continue to engage in dialogue and clearly express their concerns. Participants should strive to listen to each other and work at understanding the opposing viewpoint. Compromise is a necessary factor in any situation dealing with conflict, but if honest dialogue transpires and effective mutual learning takes place, participants are more receptive to some form of compromise decision.

Numerous EE programs focus on science, ecology and nature; these are all essential elements of environmental education. But what about conflicts? How do we deal with questionable issues? Due to the unique subject matter of environmental education, it ought to be conveyed in a way involving active participation and dialogue. If practiced at a young age, transactional planning teaches children to take challenges and risks in expressing themselves and listening to others, especially those of differing viewpoints. It is the experiential part of education that motivates children, not the memorization of facts and figures. What is the key to education if it isn't motivation to act and do, creating changes for the future?

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Where is EE Being Taught? Urban Teachers' Experiences

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Introduction

It is not uncommon to describe environmental education in terms of its infusion across the curriculum or the need for it to be implemented at all grade levels. EE can also be described as taking place in different settings, from activities that can be taught in the classroom, to visits to a local natural history museum, to excursions to natural areas such as forest preserves. Each setting offers a different set of valuable opportunities--the chance to see wild animals at the zoo, explore a wetland ecosystem at a nearby park, or observe subtle seasonal changes on the school yard. Each setting also offers the teacher a different set of resources for instruction, while requiring varied teaching skills, supplies, and class management strategies.

Each of the various EE settings can be characterized in terms of a continuum of attributes. Thus, the classroom is a learning setting in which the teacher is very comfortable and familiar. Lesson plans and instructional supports are readily available. Likewise, within the school environment the physical needs of the children (i.e. bathrooms, heat, light, seating) are provided. The typical school, however, is characterized by an environment that has been modified substantially by humans and may not offer opportunities to get "out in nature."

The utilization of zoos for EE provides an example of another possible teaching setting. Although zoos often offer staff support and a great deal of educational information, a teacher wishing to give this type of experience must be willing to teach away from the familiarity and control of the classroom. As with the school, facilities such as bathrooms and a comfortable place to eat lunch are available at most zoos.

A final example of this continuum would be the use of natural areas or forest preserves for EE experiences. Many natural areas have little or no education staff and information may be limited to a trail map or a simple brochure. In this type of setting teachers are quite literally on their own in terms of designing and implementing the EE experience. Facilities that would support the experience may be limited and would typically be more rustic (e.g. picnic tables, water fountains). The forest preserve does provide, however, a true experience in nature.

Characterizing various teaching settings in terms of a continuum helps us make fine grained distinctions among them and may allow us to better understand why teachers select one type of place for EE on a regular basis, while not using another at all. The purpose of this paper is to describe which settings are being used and to explore what perceived barriers and benefits may be associated with the use of various types of settings.

Methods

A random sample of teachers from the Chicago area were mailed a questionnaire which solicited their perspectives on the barriers and benefits of providing nature experiences for their students, which settings they have used for teaching about nature, and background information about their personal experiences with natural areas. Teachers were sampled from the mailing lists of a Chicago nature center, a Federally sponsored science enrichment program, a residential outdoor/environmental education field center, as well as Chicago Public Schools. Approximately 29% of the questionnaires were returned. Additional details on the methods used for this study are described in Young and Simmons (1992).

Study Participants

Respondents represent a broad range of backgrounds. Although a number of study participants were new to teaching, the vast majority have been teaching for at least five years. Most grew up in urban areas with less than 10% growing up in a rural setting. The majority have completed at least some graduate work.

Results

Which Settings are Being Used

The teachers were asked to indicate whether or not they utilize specific learning settings (e.g. classroom, zoo, nature center) to teach about the environment. A quick look at Table 1 shows that these teachers are using their classrooms, museums, zoos, and school yards most often to teach environmental education. Resident centers, nearby natural areas, city parks, and forest preserves are least often used.

Which settings are being used is informative in and of itself, however, they do not address the question of why some teachers may be perfectly willing to teach EE at their school or even at a museum, but do not utilize natural areas as teaching settings. To facilitate this analysis, the teaching settings were grouped together based on correlations, resulting in three distinct dimensions: School Based Settings, Built Settings, and Natural Areas. School Based Settings included the use of the classroom and school yard. Built Settings included use of places such as the zoo, museum, arboretum, botanic garden, and aquarium. Natural Areas, the least often used settings, included forest preserves, nearby natural areas, city parks, nature centers, and resident centers.

Relationships Among Perceived Barriers & Benefits and Utilization Rates of Settings

Teachers were asked a series of questions that reveal their motivations and perceived barriers to providing nature experiences for their students (for a detailed discussion please see Young & Simmons, 1992).

Four general categories of barriers and benefits were identified: Importance of Providing Nature Experiences, Comfort Level in Nature, Training and Preparation, and Logistical Considerations. Within each of these general categories were more specific barriers and benefits.

The **Importance of Providing Nature Experiences** category included three aspects: Student Receptivity, Importance of Nature Experiences, and Back to Basics. The **Comfort in Nature** category included two aspects relating to teachers' ease/comfort with spending time in nature: Personal Comfort in Nature and Nature Mentor.

Three dimensions relating to teachers' **Training and Preparation** were also identified: Level of Preparation, Level of Confidence, and Desire Training. Finally, five dimensions were grouped under **Logistical Considerations**: Resources Not Available, External Impediments, Hazards, School Support, and Class Management.

Perceived Benefits and Barriers of Using School Based Settings

Even with a relatively high participation level overall, not all of the teachers fully utilize the classroom or school site for EE. Those who are high level users of School Based Settings are more likely to feel confident concerning their teaching skills (Level of Confidence), consider themselves well prepared and feel they have adequate lesson plans available (Level of Preparation), and not worry about the Availability of Resources (e.g. lesson planning time, equipment) as compared to those who are low level users of these settings (Table 2).

Perceived Benefits and Barriers of Using Built Settings

Taking students away from the school grounds requires a certain amount of time, effort, and organization. Even though zoos and museums provide a great deal of support through staff guides and exhibits, they still represent a foreign learning environment that requires an additional set of skills from the teacher.

In addition to those training, preparation, and resource needs identified in the section on School Based Settings, high level users of Built Settings (as compared to the low level users), were more likely to feel that providing nature experiences is essential and something that is as important as spending time on the basics (Importance of Nature Experiences and Back to the Basics). In addition, high level users of Built Settings express a greater interest in getting more training (Desire Training) and are more likely to feel that they have the support of other teachers and the administration (School Support) than do the low level users.

Perceived Benefits and Barriers of Using Natural Sites

Utilizing natural areas as learning settings requires organizing lessons without resources such as exhibits or the familiarity of the classroom environment. In addition to the barriers and benefits that related to the use of School and Built Settings, those teachers who utilize Natural Sites are less likely to worry about Class Management issues and External Impediments such as crime or lack of funding than those who do not take their students "out to nature."

Discussion

The results of this study confirm that there is a continuum of use of teaching sites from School Based Settings to Built Settings to Natural Area Sites. The results also suggest that a different set of perceived benefits and barriers are associated with each of the three teaching settings. To get started with EE at the school, the teacher must feel confident and well prepared and believe that necessary equipment is available. Training programs, and especially those targeted to novice EE teachers, should focus on the basics of helping teachers feel comfortable with their own abilities.

To arrange a trip to the museum or zoo, teachers must not only feel prepared, but they must believe that EE is worth the time and effort. Consequently, training must not assume that because teachers utilize some EE materials they are particularly convinced of its overall importance. If we want teachers to go beyond the school yard and provide these experiences, we must make certain that the rationale for EE is evident.

Additionally, to move teachers from the utilization of Built Settings to the use of Natural Area Sites for EE, they must feel that they can manage their classes in a non-formal setting. In addition, they must feel they can overcome potential impediments such as lack of funding. Training sessions must provide teachers with simple and effective class management techniques. Additionally, trainers need to help teachers learn where they can find needed resources.

Table 1
Utilization of Environmental Education Settings

SETTING	PERCENT USING
Classroom	98
Museum	81
Zoo	75
School Yard	70
Nature Center	52
City Park	47
Botanic Garden	46
Forest Preserve	43
Nearby Natural Area	35
Resident Center	17

Table 2
Benefits and Barriers Related to Use of EE Settings

Benefits & Barriers	School Based		Settings Built		Natural	
	High	Low	High	Low	High	Low
Importance of Nature	4.2	4.2	4.4	4.0***	4.3	4.0***
Student Receptivity	4.3	4.3	4.4	4.3	4.3	4.3
Back to the Basics	2.3	2.6	2.1	2.7***	2.4	2.7*
Personal Comfort	4.3	4.1	4.2	4.2	4.3	4.2
Nature Mentor	2.5	2.5	2.6	2.6	2.6	2.4
Hazards	2.8	2.7	2.7	2.8	2.7	2.9
Resources Not Avail.	2.7	3.1***	2.7	3.0**	2.7	3.1**
School Support	2.2	2.3	2.2	2.4*	2.2	2.4**
External Impediments	2.6	2.9	2.7	2.8	2.6	3.0***
Class Management	2.5	2.6	2.5	2.6	2.4	2.7**
Desire Training	3.8	3.7	3.9	3.6***	3.8	3.6*
Lack of Confidence	2.4	2.7*	2.4	2.7*	2.5	2.7*
Level of Preparation	2.9	2.7*	3.0	2.6**	2.9	2.6**

* p=.05 ** p=.01 *** p=.001

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Geographic Information Systems (GIS) as an EE Tool

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Geographic Information System (GIS) has become a buzzword in environmental circles. It seems that everyone from government agencies to environmental groups have wholeheartedly joined this technological revolution. GIS is a technology that environmental educators should understand and utilize.

Geographic Information System (GIS) can be defined as a system for entering, storing, manipulating, analyzing, and displaying geographic or spatial data, (Congalton and Green, 1992). It is a powerful computer based system that allows resource planners, developers, and managers to handle large amounts of spatial data more easily. The computer software is highly variable, and ranges from large, complex, and expensive to small, relatively simple, and cheap (even free). GIS software can be found that will run on almost any type of computer from mainframes to personal computers.

Because of the proliferation of GIS technology in the workplace as well as in universities and other educational arenas, data and educational applications are rapidly becoming more available. Universities are training graduates to use GIS in their various fields of study because the job market is now demanding those skills. Not so long ago computers were expensive and complex. They required experts to operate them. Gone are the days when simply knowing how to use a computer was a major advantage. Today almost everyone uses computers at one time or another and increasingly younger students are becoming adept at using them and the many software applications available. GIS's use particular software that should be introduced.

Perhaps a more compelling argument for integrating GIS into the classroom is the ability to teach many concepts through a hands on approach to learning. Using a GIS system allows a student to be involved with almost all subjects taught in public schools. It also allows a new way of getting these subjects and the concepts therein across to the students. Because GIS is a geographically based system, it is easy to see real world application of those concepts. Results are not only discussed or written, but are also graphically seen in an environment that is familiar and stimulating (the computer).

There are three primary problems currently limiting GIS technology in environmental education programs. First, the price of computers is still limiting in some areas. Full scale GIS programs require relatively sophisticated personal computers. One solution is to use computers that are currently available at schools. These computers may be less than optimal in performance, but they can be used for simpler GIS software that is currently available. Also, there is no reason to expect the downward trend in computer and software prices will end soon, so if not economically available now, these systems may be in the future.

Secondly, there is limited number of data sets and educational modules available. Fortunately, for many basic environmental education activities specific data sets aren't needed. In fact, most software packages come with example data than should suffice until others can be obtained. Data should become more available, but current sources of data include government agencies, universities, and less sensitive corporate data.

The last and probably most important problem is typical of new technology, the lack of trained personnel to operate the GIS. Environmental educators will either have to train themselves on basic GIS software or participate in recognized training program.

A project nearing completion at Stephen F. Austin State University in the College of Forestry is an example of a government project that could be easily turned into an environmental education module. Texas Parks & Wildlife contracted with the College of Forestry to provide a master plan for a newly acquired state park (Fort Boggy State Park). A park master plan is a document that provides an established framework for consistent and orderly planning, development, and administration of park resources, programs, and facilities. Because the master planning process is inherently spatially oriented, the use of GIS technology allowed improvements in ease, speed, updating and reliability of the master plan.

Most GIS' data is stored in thematic layers of information. For example: one layer might be current vegetation types, another might be the road network, while another is population demographics. The common thread is that all of these are geographically referenced, meaning they correspond to a known location on the Earth. This provides the GIS the ability to do powerful analyses across these layers of information. The GIS can also combine thematic layers to create new ones showing geographic relationships.

The construction and maintenance of the database is the most difficult portion of the GIS application. Because this has already been done in the Fort Boggy Project, it is a ready to use data set. Over twenty thematic layers are now formed. Analysis has been conducted on these layers to determine what types of recreational developments should be placed on the park site, where they should be located, and to show their influences upon the landscape.

If a school had a GIS and Texas Parks & Wildlife desired to let them use the data set for educational purposes, a very good example GIS application could be used to teach environmental education. A sample data set could be shipped to the school that included a Topography Layer, Vegetation Layer, Soils Layer, Surface Water Layer, Roads Layer, and Proposed Development Layer, etc. This example data set could be used to teach many concepts.

The obvious example is to put the students in the place of the planners. They can be asked what they would do. What information would they need to make the decisions? How they would design the park? Then they can see the results and impacts. The students could then prepare maps and graphics to show what they have planned.

Because the instructor chooses how in depth to go with the application, it can be designed to fit any grade level. Elementary students may just view layers of information (maps) and see graphical relationships of geographical entities, where middle and secondary school students may take on various levels of analysis and decision making.

A geography teacher could use the information in the soils, surface water, and vegetation layers to teach anything from soil formation to the interaction of soils, water, and vegetation. A science teacher may teach about wildlife habitats and the potential impact of the proposed developments. A history teacher could teach about past settlement patterns and the impact of man's recent activities upon the landscape. The list could go on and on.

As educators become more familiar with the software and hardware more data could be added and new thematic layers could be constructed. Analysis ranging from simply producing maps to sophisticated modeling that answers what if questions could be performed. The power of the GIS computer system is that it can be repeated or changed very rapidly.

As more peripheral equipment is added to the GIS, flexibility is increased. Maps, photographs, video frames, or any other types of images can be digitized as new layers of information. Printers and plotters can produce maps and graphics for further analysis and presentation.

GIS has expanded into every major job market and most universities. It is a technology that should enhance educational experiences in a variety of topics. There are problems and limitations, however these can be dealt with successfully.

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Computers and Environmental Education Centers: What is the State of the Art?

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The Directory of Natural Science Centers defines a nature center or an environmental education center as "an organized and permanent nonprofit institution which is essentially educational, scientific, and cultural in purpose with professional staff, open to the public on some regular schedule. The nature center manages and interprets its lands, native plants and animals and facilities to promote an understanding of nature and natural processes. It conducts frequent environmental education programs and activities for the public." (Natural Science for Youth Foundation, 1990).

Electronic computers have made their way into environmental education centers across the country as tools for administration and education. The computer, simply put, is a tool and like a wrench or a screwdriver. It does not function on its own initiative. However, computers can perform a variety of unrelated tasks by simply changing programs. One minute it is a typewriter, then a calculator, or a musical instrument, or a game, to name a few possibilities. It has the capability of providing support in the office as well as exhibits. A good system could provide information to the visitor quickly and concisely so they would have more time for other activities.

Study Area

The study included the nature centers in eleven southern states. These states were Alabama, Arkansas, Georgia, Louisiana, Missouri, Mississippi, Kentucky, Kansas, Oklahoma, Tennessee, and Texas. The sites chosen were found in the Directory of Natural Science Centers (Natural Science for Youth Foundation, 1990). Surveys were sent to each of the 188 sites listed in the directory.

Questionnaire

The questions for the survey were developed by reviewing technical literature including reader surveys found in publications such as *Mac* and *PC Week*. The questionnaire used for this study was divided into four major mailings. The first mailing was sent on June 12, 1992 and was designed to determine if the site had a computer and if the staff would participate in a further study of computer use. The survey was sent to all 188 sites in the study area with a 78.7% response to the first mailing.

From the first mailing, 116 sites were identified as having computers. On January 19, 1993 a second survey was sent to this group. This survey provided information concerning software, hardware, and use. There was a 52.3% response to this mailing. The third survey was sent on January 25, 1993 to the group that indicated they did not have a computer. A total of 32 surveys were sent. This mailing was designed to query why they did not have a computer. The survey also asked if they planned to acquire a computer within the next year as well as other general descriptive information. Of these sites, 68.75% responded.

The fourth mailing was sent to the group that did not reply to the initial survey. It was sent on February 6, 1993 to forty sites. It asked if the site had a computer, to determine whether non respondents differed significantly from respondents in the possession of computers. The response rate was 67.5%.

Results And Discussion

Response to Initial Questionnaire

From the initial survey, 148 (78.7%) were returned. One hundred sixteen (78.4%) sites responded "yes" to having computers. Thirty two sites (21.6%) responded "no". A questionnaire was sent to each site that did not respond to the initial survey. The follow up was a postcard that asked if they had a computer at the center. Eighty-five percent of respondents indicated they had computers at their centers. This was not a significantly greater number than the respondents to the initial mailing at the .05 level based on confidence limits for percentages (Rohlf and Sokal, 1969).

Types of Computers

Several different types of computers were reported by the nature centers. The most popular were IBM/IBM compatible machines followed in order by Macintosh, Apple and Others (Figure 1). None of the surveyed sites reported use of a mainframe computer or a workstation.

The cost, flexibility, and strength of present desktop computer technology seems to preclude the need for an expensive workstation or mainframe system in nature centers. None of the centers indicated possession of either a workstation or a mainframe system.

Peripheral Devices

Peripheral devices are input/output units and storage units attached to the central processing unit of a computer system (Spencer, 1992). Most sites had what could be considered basic computer equipment (Table 1).

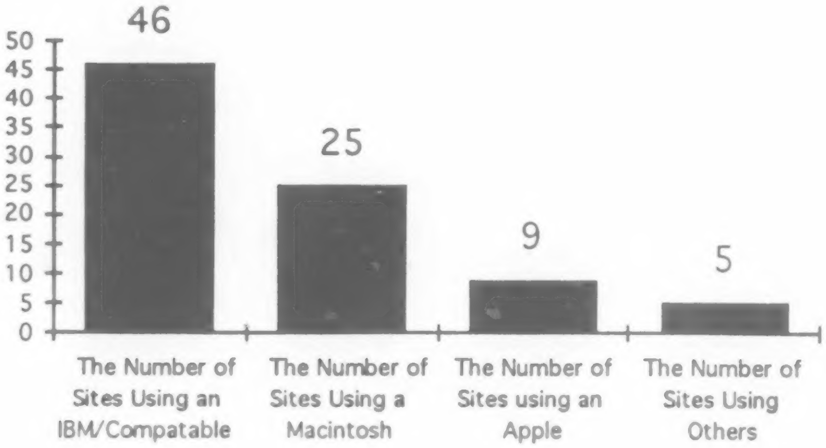


Figure 1. The Number of Sites Reporting the Use of a Particular Type of Computer

(N=57, Sites could choose More Than One Type).

Table 1
The Percent and Number of Sites Reporting the Use of a Particular Type of Peripheral Device (N=57, Sites could choose More Than One).

Dot Printer	80.7%	46
Laser Printer	59.6%	34
Color Printer	1.8%	1
Color Monitor	59.6%	34
Hard Disk	45.6%	26
Backup System	15.8%	9
Scanner	21.1%	12
Removable Storage	8.8%	5
Touch Screen	5.3%	3
Film Recorder	0.0%	0
Tape Drive	10.5%	6
CD-ROM	1.8%	1
Other Devices	19.3%	11

This included dot matrix printers, laser printers, and color monitor. There was a lack of equipment such as scanners, film recorders, and CD-ROMs.

Add-On Boards

Add-On Boards are components that are attached to the motherboard of a computer. These boards are used to enhance the capabilities of the computer (Spencer, 1992; Covington and Downing, 1992). Several Types were found to be in use (Table 2).

Software Used

Software is a term used for the program or set of instructions that tell the computer what to do (Spencer, 1992). The sites surveyed tended to concentrate on word processing, database management, and graphics (Table 3).

Computer Usage

For this discussion, computer usage is defined as either internal, external, or both. Internal use is that use that takes place in the office environment. External use is where the public has access to the computer, such as an exhibit (Figure 2).

Networking is an environment in which communication takes place between computers and/or output devices. This allows the sharing of data or information between computers. A network also allows several computers to share a single output device.

Almost half of the sites surveyed that used computers made use of networking (45.6%). Most of these sites were making use of a modem (80.8%). This means that these sites already have the capability to connect to banks of useful information.

Budgets

Among the sites responding to the survey, the mean annual budget was $246,514.57. This budget is for sites having a computer. Among the sites responding to the survey, the average amount that was planned for computer expenditures in the coming year was $2074.36. No evidence was found in this survey that indicated cost or annual budget as the main reason most sites lacked certain types of equipment. There was very little correlation (unadjusted correlation coefficient: 0.3264) between the size of annual budgets and next year's computer budget. It is perhaps a problem of inadequate or insufficient support, a Table 2.

Table 2
The Percent and Number of Sites Reporting the Use of a Particular Type
of Add-On Board (N=57, Sites could choose More Than One).

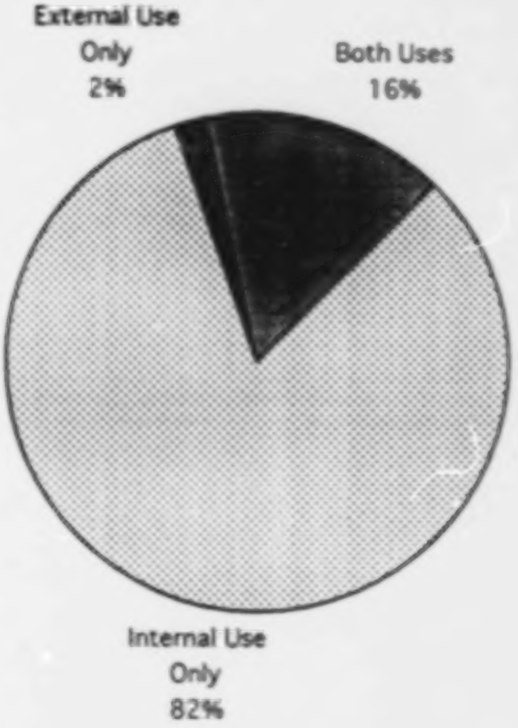
Memory	17.5%	10
Graphics	19.3%	11
Ethernet/Com	7.0%	4
Video In	1.8%	1
Video Out	3.5%	2
Other Card	10.5%	6

Table 3
The Percent and Number of Sites Reporting the Use of a Particular
Type of Software On Board (N=57, Sites could choose More Than One).

Graphics Program	49.1%	28
CAD/CAM	3.5%	2
GIS	0.0%	0
VIS	0.0%	0
Desktop Pub	45.6%	26
Desktop Present	1.8%	1
Database	71.9%	41
Computer Programming	7.0%	4
Accounts/Payroll	33.3%	19
Spreadsheet	68.4%	39
Project Management	3.5%	2
Word Processing	98.2%	56
Utilities	33.3%	19
Multimedia	5.3%	3
Other Programs	19.3%	11

Figure 2
The Ratio of Internal, External, and Both Uses of Computers by Environmental Education Centers (N=57).

lack of training, research, or simply a lack of will or leadership to acquire technology (Kondracke, 1992).



Reasons for No Computer

Of the sites that returned the survey, 31.8% (7) indicated that they had no need for a computer. Cost was a limiting factor in 40.9% (9) obtaining a computer. No sites listed "unfamiliarity" as a factor in not having a computer. Of the sites surveyed, 9.1% (2) indicated that space limited their ability to obtain a computer. Finally, 22.7% (5) listed other responses such as funding/regulation restrictions, computer access through other means, and the fact that a computer purchase was in process. Only one site indicated that it was going to purchase a computer next year. The participants had the option of choosing more than one reason for not having a computer.

The average annual budget of the sites indicating they did not have a computer, was $333,006.64. The average annual budget of "no" sites was $86,492.07 larger than sites with a computer.

Recommendations

1. Efforts should be made to enhance the usage of hardware including computers, add-on boards, and peripherals.
2. Centers should be encouraged to explore ways to expand the current level of software exploitation.
3. The use of networking as both an economizing and communication tool should be explored. Local Area Networks could be used within centers to reduce redundant equipment and to share information.
4. The use of computers in what would otherwise be static exhibitry should be encouraged to enhance the visitors' experience. Computerized exhibitry has great potential especially if the programming is site specific. Computer based multimedia programs are better at communicating messages than static displays which often are just as expensive.

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The Environmental Action Internal Control Index (EAICI)

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Numerous attempts have been made to study the relationship between locus of control of reinforcement (LOCR) and environmentally responsible behavior (ERB). However, most of these studies were conducted with either instruments of questionable reliability and validity or dubious methodology. A detailed discussion and analysis of this research, including the instruments, can be found in Smith-Sebasto (1992). The Environmental Action Internal Control Index (EAICI) was developed to address this problem.

Development of the EAICI began with the identification of 187 examples of pro-environment behaviors from numerous published sources in the popular press. Therefore, EAICI items are those that should have a high behavior-attitude relationship (cf. Fishbein and Ajzen, 1974). Pretests reduced the number of items contained in the instrument to 28.

The field test was administered to 853 undergraduate students enrolled in an introductory biology course during the Spring quarter at a large research university. The complete paper/pencil instrument was presented in three different versions. All versions contained the 28-item EAICI; an Index of Environmental Action Knowledge and Skill (IEAKS), which is a slight modification of Sia's (Sia, Hungerford, and Tomera, 1985/86) Section IV; and an self-report of environmental action-taking entitled the Environmentally Responsible Behavior Inventory (ERBI), which is a conglomerate of Sia's (Sia, Hungerford, and Tomera, 1985/86) Behavior Inventory

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of Environmental Action, a Roper Organization item (Roper, 1990), and "A User's Guide to Planet Earth: The American Environment Test" designed by Rush/Winston Productions in conjunction with the U.S. E.P.A. and broadcast by the ABC on April 16, 1991. Also evenly divided and included in the instrument were the Brown Locus of Control Scale (Brown, 1990), the Internal Control Index (Duttweiler, 1984), and the Need for Control Scale (Korteland, 1989). The three versions of the instrument were randomly distributed to the study participants.

Testing the null hypothesis that the subjects completing either version 1, 2, or 3 of the instrument were simply independent samples drawn from the same parent population, an analysis of variance was performed to determine if the means of the scores on the field test version of the EAICI, the IEAKS, or the ERBI differed between the three groups. The three groups were not statistically significantly different when compared by version completed. Therefore, the null hypothesis was supported.

The three new instruments were all shown to be internally consistent. The Cronbach coefficient alphas of the EAICI, the IEAKS, and the ERBI were .94, .88 and .92 respectively.

Using Pearson product-moment correlation analyses and an *a priori* alpha of .05, the following were observed: the relationship between scores on the EAICI and the ERBI was statistically significant moderate positive ($r=.33$, $p<.01$). The relationship between scores on the EAICI and the IEAKS was statistically significant low positive ($r=.23$, $p<.01$). The relationship between the scores on the EAICI and the BLOCS was non-significant negligible negative ($r=-.02$, n.s.). The relationship between scores on the EAICI and the NFCS was statistically significant low positive ($r=.17$, $p<.01$). The relationship between scores on the EAICI and the ICI was statistically significant low positive ($r=.13$, $p<.05$). Interpretation of these findings suggests that since the correlation between scores on the ICI, a scale which measures the generic internal orientation of the LOCR construct, and scores on the EAICI, a scale which measures the internal orientation of the LOCR construct specifically as it relates to ERB, is stronger than the correlation between scores on the BLOCS, a scale which does not specifically measure the internal orientation, that the EAICI displays convergent validity. Additionally, scores on the ERBI were more highly correlated with scores on the EAICI than with scores on either the BLOCS, the ICI, or the NFCS. Also, since the correlation between scores on the EAICI and the NFCS indicate that the two scales are not likely measuring the same construct, evidence of discriminant validity of the EAICI is provided.

Since the goal of this research was to develop a LOCR scale that could be used to predict ERB, a discriminant analysis was performed between scores on the ERBI and the EAICI. Scores on the ERBI were divided into two groups: those indicating that, on average, they "frequently, in about 70% of the chances where I could have" involve themselves in ERBs and those indicating that, on average and at best, they "sometimes, in about 50% of the chances where I could have" involve themselves in ERBs. The items in the EAICI were then analyzed to determine how well the two groups could be classified. Nearly 82 percent of the grouped cases were correctly classified.

Another discriminant analysis was performed between scores on the IEAKS and the EAICI. Here, the attempt was made to assess whether knowledge of an individual's perception of her/his level of knowledge of or skill at the use of ERBs could predict the same individual's LOCR orientation. Scores on the EAICI were grouped into two categories: those indicating that on average they "agree" that by performing the listed ERBs their individual behavior could "improve the quality of the environment" and those indicating that on average and at best they are "unsure" that by performing the listed ERBs their individual behavior could "improve the quality of the environment." Sixty-one percent of the group cases were correctly classified.

Finally, a discriminant analysis was performed between scores on the IEAKS and the EAICI to assess whether knowledge of an individual's LOCR could be used to predict the same individual's perception of her/his level of knowledge of or skill at the use of ERBs. Scores on the IEAKS were grouped into two categories:

those indicating that on average they perceive themselves as having "above average" knowledge of and skill at the use of the categories of ERBs and those indicating that on average and at best they perceive themselves as having "average" knowledge of and skill at the use of the categories of ERBs. Eighty percent of the grouped cased were correctly classified.

The results of the data analyses support several suggested relationships. The relationship between LOCR and ERB generally appears to be supported by this study. However, a key distinction between this study and other studies is the effort directed at predicting behavior. Previous studies have attempted to predict behavior on the basis of the correlation between two sections of an instrument designed to measure LOCR and citizen action. While this study addresses the same correlation, it goes one step further and assesses whether the EAICI can accurately classify individuals reporting high-levels of ERB from individuals reporting low-levels of ERB on the basis of their score on the EAICI.

What has been lacking is an instrument of demonstrated reliability and validity to measure the LOCR of individuals as it relates specifically to ERB. The effort reported here can be considered a preliminary step in acquiring such an instrument. With this instrument and the knowledge that it can accurately predict performance of ERBs as well perceived knowledge of and skill at the use of environmental action strategies, environmental education professionals can begin to study ways in which environmental education curricula can, as Iozzi (1989) urges, "improve, change, or alter" LOCR. If the EAICI can help environmental educators assess the impact of their efforts on the LOCR of students, then the field of environmental education will have moved one step closer to achieving the goals of the discipline as stated over 20 years ago.

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Perception of Risk from Environmental Hazards--A Comparative Study of Undergraduates in the United States and Costa Rica

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Many studies have found differences in risk perception between genders, with females indicating greater fears than males. For example, Croake, Myers, and Singh (1988) reported that females expressed greater fears in the category Ecology. That category included "pollution, overpopulation, [and] running out of natural resources" (p. 143). Pijawka, Cuthbertson, and Olson (1987) noted that females evacuated the Three Mile Island disaster area in greater proportions than did males. Also, females were more "likely to experience stress over perceived accident recurrences and express fear over radiation hazards" (p. 284). In the only nationality study of risk perception, Barton (1986) studied the fears of adolescents in Finland and England. Subjects in Finland had greater fear of war than those in Bristol. And as the blazing oil well fires in Kuwait testified, war can be a source of environmental hazards. For an example of a study that contrasted perception of risk to the environment with perception of risk to self, see Schmidt and Gifford (1989).

Method

The questionnaires were administered to volunteer undergraduates from the University of Costa Rica in San José, Universidad Nacional in Heredia, and Emory University in Atlanta, Georgia. The questionnaire used was adapted from a study by Peterson (1991). Two 4-point Likert-type scales assessed perception of risk to one's self and to the environment from 20 environmental hazards. Prior to sampling, the English version was translated into Spanish for the Costa Rican students.

Results

To examine the relationship between students' perception of risk to the environment and perception of risk to self, grand means were obtained. They were 3.247 for perception of risk to the environment and 2.918 for perception of risk to self. A t-test revealed that the difference between grand means was significant ($p<0.001$). The results showed that college student's perception of risk to the environment is significantly greater than their perception of risk to self.

Student responses between the two scales were consistent. A high (or low) value for perception of risk to the environment was generally accompanied by a high (or low) value for perception of risk to self. The Pearson Product-Moment Correlation between the scales was obtained ($r=0.637$). This value was statistically significant ($p<0.01$). There is a strong correlation between perception of risk to environment and perception of risk to self.

To assess the relationship between perception of risk to the environment and to self by gender and nation, variable means were obtained. For each scale, females expressed greater average perception of risk than males and Costa Ricans expressed greater average perception of risk than Americans. Each of these differences was significant ($p<0.0002$).

Individual hazard means were also obtained by nation and gender and their differences tested for significance. In every case for both scales, mean female perception of risk was greater than that for males. For only four hazards did the United States students have greater mean perception of risk than the Costa Ricans. These means are significantly different for 72% of gender comparisons and 72% of nation comparisons.

In both scales significant ($p<0.05$) interactions were found for water pollution, global warming, acid rain, ozone layer depletion, oil spills, and nuclear power. In the environment scale, radon gas showed significant interaction effect. The significant interactions that occurred only in the self scale were automobile exhaust and air pollution. These findings may be explained by the predominance and visibility of these pollutants in most major cities. Also, in Costa Rica, the diesel fumes that cause air pollution are more visible than emissions from gasoline engines in America. None of the other hazards produced significant interaction effects.

Discussion

The gender differences revealed by this study do not constitute new information. They simply add to a steadily increasing amount of concurring literature. However, the information concerning nation differences is new. This study found that nation, as well as gender, plays a strong role in risk perception from environmental hazards.

A surprising result was that American students have greater fear of population growth than do Costa Ricans. In 1990, the United States was the fourth largest populated nation in the world. Costa Rica did not make the top ten list and neither did any other Latin American country (Miller, 1992). The rationale behind continued increases in population growth in developed countries may be partially explained by perception of risk. Students perceived relatively high risk to the environment from population growth, however, in the scale for perception of risk to self, it was third from the last. Until there is a willingness to make sacrifices in one's own life for the benefit of the commons, individuals will continue to perceive risk to the environment only and continue to perceive no risks to individual suffering.

A partial explanation for some of the misperceptions suggested in these results might be found in observations made by Greenberg, Sandman, Sachsman, and Salomone (1989). They tallied the number of minutes that news programs devoted to environmental hazards. It is possible that radon, being invisible to the human eye, is not viewed as a serious threat. Conversely, hazards that we can see are deemed more hazardous. In this study, the means for all hazards were ranked and sorted. Those that ranked the highest were generally more popularized hazards, such as destruction of tropical rain forests, water pollution, ozone depletion, and global warming. The more unseen, unpopularized hazards ranked nearer to the bottom (e.g., asbestos, radon gas, and decrease in the oil supply). An ironic outcome was that the greatest potentially catastrophic hazards, ozone depletion, global warming, and nuclear power, ranked lower than destruction of tropical rain forests in terms of perceived risk to the environment. This result is illustrative of the need for education in risk realities.

Currently, risk education is not part of environmental education. Several authors have cited the need for perception of risk as a new aspect of environmental education. Ramsey, Hungerford, and Volk (1992) stated that misperceptions of risks continue even though environmental education has existed for 30 years. Educational materials in risk perception need to be designed and tested. Development of such materials is dependent on studies like this that broaden the research base.

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Marine Issues--A Summer Science Program

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The EPA's Gulf of Mexico Program reports that two-thirds of the continental U.S. drains into the Northern Gulf. The Gulf of Mexico also produces about 40% of the U.S. commercial fish yield, 92% of which is gulf estuarine dependent. An estimated 383,000 acres of salt marshes stretch along Florida's gulf coastline alone. Most of these marshes are from the Big Bend up along the Panhandle (Hale, Villadoas-Bell). These ecological "nurseries" for fish, shellfish, birds, are the most important hydrology systems, for this is where the food chain begins. They are also the filters for all the pollution flowing off the land. This fragile and complexly related hydrology system will be further taxed as populations along waterways grow. Demographers predict that 75-80% of the U.S. population will live within 50 miles of the coast in the next 20 years (U.S. Census Bureau: Calkins). This assures increasing pressures on all hydrology systems, the circulatory system of the land.

Demographic forecasters also are estimating that only 10 percent of new U.S. workers in the year 2000 will be white males. The work force will be largely composed of minorities, many of these minority women (Working Age) All of these changing demographics must be taken into account when dealing with marine and environmental issues generally.

Here along the Gulf Coast as in other parts of the country the environmental movement is typically "lily white." Minorities tend to be more involved in people issues such as drug abuse, homelessness, and other social issues (Environmental Magazine). This is also reflected in the low numbers of minorities which go into scientific, particularly marine fields of study. Along the Gulf Coast, the largest minority, African-Americans, represent a very small percentage of degrees granted in scientific fields and professions yet 31% of the school population along the panhandle are African-American. This trend is reflected also in national studies. The National Science Foundation reports that in the physical sciences African-Americans represent less than 5% of the bachelors degrees, 2% of masters, and 2% of doctorates in these fields. In mathematical sciences African-Americans represent less than 6% of the bachelors degrees, 4% of the masters and 1% of the doctorates. In computer science and technology areas African-Americans earn less than 8% of the bachelors degrees, 4% of the masters and 1% of the doctorates. When looking at scientific degrees earned by minority women, the percentages are usually less than 1%. There are a variety of reasons according to research as to why minorities, particularly minority women are so under-represented in scientific fields:

1. Negative Attitude Toward Science and Math

Although most teachers don't consciously act on, or hold biases about students determined by skin color or gender, students do pick up unconscious signals. For over two decades research has shown that teachers have learned well the biases present in our society. There is a hierarchy at work in the classroom with females and minorities at the bottom (Sadker & Sadker). Student expectations of their roles and abilities is also linked with self-concept and plays back into motivational problems and individual goals. Academic failures and low teacher expectations feed these negative attitudes.

2. Lack of Role Models

This is obviously a problem with under-representation. Teachers of color are significantly under represented among science school faculty K-college. While this does not directly exclude minorities from these fields, many students feel more enthusiasm and motivated to try something new or challenging whey they "see someone like me" as a classroom or professional leader (National Center for Education Statistics). Mentors, a crucial support source are often non-existent (Wyche & Frierson).

3. Inadequate Pre-college Preparation

The relationship between high school program choice and later career goals is obvious. Middle school course enrollments seem to be a strong indicator of high school program plans. Students enrolled in higher math's, foreign language and science with laboratories are more likely to enter a college preparatory program (U.S. Department of Education). A study by the college board indicates math appears to be a "gate keeper" course for decisions to go on to college (West).

4. Lack of Motivation

There also appears to be a considerable inconsistency between educational expectations and high school program plans among black eighth graders. Sixty-four percent of black eighth graders indicate they expect to finish college or obtain a graduate or professional degree, but only 25% plan to enroll in a college preparatory program while in high school (U.S. Department of Education). This is contributed to by lack of expectations from counselors and lack of appropriate role models (Wellesley Center for Research on Women).

5. Limited Knowledge of Science-based Careers

Research on career counseling (Campbell, Basinger, Davner, & Parks) has shown that females and minorities were made aware of fewer occupational options open to them, and that lower expectations for the probability of success in the work world were also communicated by counselors.

There is an obvious link with motivation to take higher track courses and therefore be inadequately prepared for post-secondary level science/math coursework.

From the elementary to the university level the scientific educational pipeline for minorities particularly minority women, becomes increasingly constructed through lack of support or mentoring, lack of opportunities or knowledge of options, or lack of early science and math sequences. It becomes obvious that conscious efforts must be made to increase minority, particularly female minority participation in science related careers.

Cultural factors need to be addressed along with those factors which seek to foster interests in science fields. A study by the Office of Technological Assessment points to specific factors which contribute to students choosing science related careers. These include:

1. Early research participation and exposure to how science really works.
2. Finding science intrinsically enjoyable and fun.
3. Having an enthusiastic teacher who encourages positive attitude toward science.
4. Participation in an intervention program which develops interests, enthusiasm, and self-esteem.
5. Having access to labs and a science environment.
6. Meeting or observing scientists or engineers as a role model.
7. Being exposed to "hands-on" reality based science.

Additionally, factors which influence participation of minorities and girls are:

1. Hands-on activities which promote an active rather than a passive role.
2. Role models of male and female scientists of various racial/ethnic background. (in person and in text and video and film)
3. Teacher education programs, pre-service and in-service which make teachers aware of the subtle behaviors that communicate expectations to particular students.
4. Encouragement from teachers to begin math and science sequences in the 8th grade.

PREP a middle school science/math program at The University of West Florida has been designed and run for the past three years with the aforementioned problem areas in mind. While the program does not seek to have all participants follow a scientific career it does offer opportunities to build interest in science areas. Since the geographic location is along the Gulf Coast, much emphasis is placed on marine activities.

The program design is integrated and trans-disciplinary focusing on those higher order research skills used in all science based fields (analysis, evaluation, synthesis). Mathematics is integrated into the program content areas in an application mode (research statistics) as is computer technology. All activities are hands-on, with students working in research "teams" with professional researchers. Participants work directly with researchers shadowing many of the activities which personify the researchers' fields.

The activities are designed to serve several functions: 1) teach problem-solving patterns used by all research personnel; 2) expose students to career options in the science field; 3) build mentoring relationships with scientific personnel as well as peers; 4) increase interest in science fields and lend relevancy to school coursework; and 5) building self-esteem.

The program runs for four weeks in the summer with two weeks of rotating day activities and two weeks in residence, usually at a research facility.

Support for the program is mixed, with federal, regional and private foundation funding. For more information on PREP contact: Dr. Eleanor Williams, Educational Research and Development Center, The University of West Florida, 11000 University Parkway, Pensacola, Florida 32514-5753. (904) 474-2071

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Quality Indicators of Early Childhood Environmental Education Programs

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A study was done to identify "quality indicators" of early childhood environmental education programs. This study focused on both a review of the literature and an analysis of several existing programs. The "quality indicators" thus identified represent "best practices" in both early childhood education and environmental education and are consistent with the "principles" outlined by Cohen (1992) in a review of the literature on children and ecology. The twelve quality indicators identified are presented below along with a brief discussion of each.

1. Environmental education is infused into all aspects of the early childhood program.

Clearly specified in the environmental education literature is the importance of an interdisciplinary approach versus "a subject apart" approach (Burrus-Bammel & Bammel, 1990; Clark, 1991; Ham, Rellergert-Taylor, & Krumpe, 1987/88). Such an orientation also matches the approach advocated for early childhood education, where best practices call for an integrated curriculum versus a subject-by-subject approach to education (Bredekamp, 1987).

2. Play is valued as the most appropriate learning medium for young children.

   Whether learning about the natural environment or any other area of understanding, young children learn best when they are having fun. Play is the child's work and respects their intrinsic motivation to learn. Play also facilitates the integration of learning across all developmental domains (cognitive, language, affective, social, physical, etc.) and encourages children to learn by way of exploration and discovery (Bredekamp, 1987). Learning through discovery is advocated in the early childhood education (Bredekamp, 1987) and environmental education (Burrus-Bammel & Bammel, 1990; Hart, 1981; Iozzi, 1989) literature.

3. Physical, mental, and emotional engagement with the environment is encouraged.

   Young children learn by being actively involved with materials, peers, and adults (Bredekamp, 1987; Piaget, 1962). Effective learning, however, requires more than physical involvement. Mental and emotional engagement are also required and supported in both early childhood education (Cohen & Trostle, 1990; Furman, 1990) and environmental education (Iozzi, 1989).

4. Conceptual versus rote learning is emphasized.

   Children learn by constructing their own knowledge about the world, not by memorizing facts (Piaget, 1962). Rote learning tends to focus on isolated bits of information, while conceptual learning focuses on meaningful understandings (Carson, 1984; Clark, 1991).

5. Context as well as the content is carefully considered.

   Curriculum for young children might be defined as everything they experience. This includes the physical environment, the daily routine, and the way people interact with each other and the natural environment. Every aspect of an early childhood program sends some type of message to the children. To foster positive attitudes toward the natural environment, about oneself, or about others, positive messages must be sent (Caduto & Bruchac, 1992).

6. Opportunities for positive interactions with natural elements are provided on a daily basis.

   Children need frequent positive experiences with the natural world if they are to develop feelings of caring and respect for it (Carson, 1984; Peterson & Hungerford, 1981). They can't live isolated from the natural environment and yet come to know it in a personal and caring way (Wilson, 1993a).

7. Outdoor activities provide safe, pleasant, and memorable experiences.

   Children need to feel safe outdoors and come to know it as a place where they can have fun and pleasant experiences. Such an environment fosters an understanding and appreciation of the natural world (Callander & Power, 1992; Peterson & Hungerford, 1981; Van Matre, 1990; Wilson, 1993a).

8. Positive social interaction and cooperation are encouraged.

   Everything in the natural world is connected--this includes humans connected to each other and to the world of nature. Promoting social interaction and a sense of cooperation can help children experience the meaning and value of interconnectedness (Caduto & Bruchac, 1992).

9. Adults provide sufficient modeling, guiding, and facilitating.

Adults play a very important role in early childhood education. It's a role that requires active engagement throughout every aspect of the program (Bredekamp, 1987). In introducing young children to the world of nature, the "complete" teacher realizes that he/she must be a leader and interpreter of the natural environment (VandenHazel, 1987/88).

10. Opportunities are provided for active family involvement.

The interest and involvement of parents in nature appreciation activities intensifies the interest of their children. The parents' interest and involvement also validates the children's efforts to learn about and care for the natural world (Wilson, 1993b).

11. Multicultural perspectives are introduced.

Both the natural environment and the human community display great beauty and diversity. These qualities aren't always recognized and appreciated. Early childhood environmental education presented from multicultural perspectives has the potential for enhancing awareness and appreciation of both the natural environment and the human community (Lane, 1993; McCracken, 1993).

12. The environment and the curriculum are adapted to accommodate children with special needs.

Young children with special needs should be integrated into typical early childhood environments versus being educated apart from their peers. Physical and instructional adaptations need to be made to accommodate the children with special needs (Safford, 1989; Strain, 1988).

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STRAND VI : PROMOTING ENVIRONMENTAL EDUCATION PROGRAMS

Arizona's Comprehensive Plan for Environmental Education--A Status Review

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In June of 1990, Arizona Governor Rose Mofford signed into law HB2675 (The Arizona Environmental Education Act) ending an 18 month odessy through the legislative process. What had started out as a simple three word addition to the education code, ultimately resulted in a comprehensive piece of legislation providing for far reaching support and definition to environmental education activities in Arizona.

One critical component of the legislation was the establishment of a Governor's Task Force on Environmental Education who was given the charge to develop a comprehensive plan to help define and guide environmental education activities in the state. In January of 1992, the finished Comprehensive Plan for Environmental Education was submitted to the Governor and legislative leaders by the Task Force.

The Plan established for the first time in the state a common set of diverse goals, objectives and action recommendations in environmental education.

Through the legislative intent of the Arizona E.E. Act, the Governor's Task Force was to develop a document that would guide integration of "... environmental education throughout the educational system and public education programs in Arizona so that awareness of students and the general public is thorough, continuous and meaningful." With this broad mission statement the Task Force itself needed to have a very broad perspective. The thirty one members of the Task Force did indeed represent a cross-section of private citizens and organizations, the formal educational community, state and federal agencies, the legislature and the Governor's Office. As a result, the final Plan offers a full range of objectives and recommendations that are applicable to any player in the environmental education arena.

The Comprehensive Plan is built around the following five major goals:

- **Each individual should have a basic understanding of the environmental sciences.** Natural systems support all life, and it is critical that children and adults understand the basic ecological and other scientific principles by which these systems operate.
- **Each individual should understand the interrelationships between human actions and the environment.** Humans are a part of natural systems, and personal and societal choices have positive and negative effects on local and global environments.
- **Environmental education should be integrated into all school curriculums.** Environmental education belongs as an integral component or thematic bridge across all programs of study in public and private schools, from the preschool to postgraduate level.
- **Diverse environmental education opportunities should be available to the general public.** The general public, including Arizona residents and visitors, deserve expanded environmental learning opportunities that are stimulating as well as educational.
- **Environmental education in Arizona should be a cooperative venture, coordinated at all levels within the state and with national and international networks.** Increased communication and cooperation among the many public agencies and private organizations involved in environmental education contributes to more efficient use of available resources and more effective, balanced programs.

To support these goals, 14 long range objectives were developed. Each of the objectives were further defined by specific action recommendations. A total of 92 recommendations were established with generally a three to five year horizon if specific timelines were not identified. Over 16 different entities in the state were identified to have the lead responsibility for specific recommendations. Examples include, the Department of Education; State Board of Education; Interagency Council on Environmental Education; Business/Industry Councils; Governor; Legislature and Governor's Advisory Council on Environmental Education.

The Task Force determined from the initial stages that the Comprehensive Plan could well lie dormant or die a quick death unless a specific body with some power base was given the charge to watch dog and implement it. In 1992, a Governor's Advisory Council on Environmental Education was established with the specific legislative mandate to update the plan every three years, annually report to the Governor and Legislature and act as the statewide body coordinating implementation of the Plan. This body, made up of nine members is in place and actively executing its charge. To date, this strategy seems to have been successful.

The Governor's Advisory Council has recently done an initial review of the Comprehensive Plan's recommendations. This review has provided them areas of concern and helped direct their programmatic efforts for the next year. Their review found that of the 92 recommendation made in 1992, 46 are actively being worked on, six have been completed and 40 have no visible activity at this time. Considering the breath and depth of the recommendations their assessment is fairly favorable. While much still needs to be done, there is still clear movement on many fronts to complete the activities identified in the recommendations. In general, the formal educational system seems the slowest to embrace the recommendations especially at the secondary and post secondary level.

The area that has probably restricted better adoption and use of the Comprehensive Plan has been in a lack of visibility. The Plan only got limited distribution (2000 copies) in the initial phases. Many people know of its existence and even it's content, but have never seen the document. The Governor's Advisory Council is currently working on a plan to reprint the whole document and separate summary brochure for broad distribution in 1994. This is expected to generate an increased level of interest in the plan.

The Comprehensive Plan for Environmental Education in Arizona, is an important and viable document. It has met its initial expectations of providing a comprehensive framework to guide and define environmental education efforts in our state. It was well designed enough on the front end that all who are interested in environmental education can see how their efforts can or should support broader statewide efforts. The Plan has also proved to be a method that encourages diverse groups to work together on a common vision. Unprecedented cooperative ventures are becoming more frequent. Groups that have and will continue to differ on specific environmental issues can work together on environmental education efforts for schools and the public.

The overall implementation of Arizona's Comprehensive Plan for Environmental Education has been a slow but steady process. Intent from the on set was that the Plan should move E.E. efforts forward but not by radical or unproductive methods. Timelines are merely guidelines to be adjusted if progress is being made. While lofty in its overall thrust the Plan is very do-able at the individual recommendation level. The Plan is working in Arizona and seems a viable document for the future.

For more information on Arizona's Comprehensive Plan for Environmental Education contact:
Comprehensive E.E. Plan, Education Branch, 2221 W. Greenway, Phoenix, AZ 85023

International Linkages in Environmental Education

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The facilitators explained that they had organized this seminar in order to explore linkages between individuals and organizations on an international level. It was felt that one of the values of the conference was to allow people time to exchange information and network. This session was set up to do that on a more formal basis. The sessions began with introductions and some general discussion. The participants then broke into three groups to allow for more detailed discussion. Some of the points discussed in the small groups are highlighted and summarized here.

- Conferences such as the Montana conference are very expensive to attend especially for international participants. Younger participants and students are especially prohibited. There has to be a way to allow information-sharing which does not involve costly conferences. It was pointed out that only 10 people from Mexico were able to attend and only about 35 from Canada. International travel even within North America has been severely limited.
- There should be a listing or network of interested people and organizations so that work exchange and information exchange can be more easily facilitated. There should be a more formal way of linking.
- One suggestion was that all participants in this session develop a basic "needs list" i.e. what type of cultural foundation must be built and then understood before trying to implement EE programs.
- The other problem with the conference is that many of the people were there to "sell their program", that is, in fact the way they can get funding to attend. This is itself a cultural difference. There is a need for "shareware" and a need to limit copyright.
- There was some feeling that there should not be too much reliance on computer systems. Although computers are useful for information exchange many people do not have access to either software or hardware. There was also discussion about the usefulness of electronic communication for those who have access to it.
- One of the inherent problems with computer communication is its "impersonalness" and the need for personal communication was clearly underlined. It was felt that cultural awareness could only be truly developed through "face-to-face" or more personal concerns.
- There was a general feeling that EE curriculum needs to be generated from the bottom up as well as from the top down. The problem with the "top down" approach is that it tends to be agencies and governments vs. grassroots organizations.
- There was general discussion about how to develop a more balanced EE curriculum that is not dominated by the United States. One participant used the term "U.S. EE imperialism." It was felt there was much to be learned from approaches in other countries such as study circles in Sweden.
- There was also some exchange about the whole issue of environment vs. economic vs. social concerns and the need for this to be clearly part of EE programming.

The discussion concluded with agreement that the list of participants in this seminar would be circulated so that further contacts and follow-up could be made. There was general consensus that the conference structure should allow for more sessions like this one where people were listening and sharing and not just "presenting their programs."

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Integrated Use and Financing--Surviving and Evolving Even with Deficit Economics

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Environmental education is caught between the proverbial "rock and the hard place." On one hand it's probably safe to say people feel concern about whether the earth will be able to support us in the foreseeable future. On the other hand we have an economy based on growth. Without growth we are told we're in a depression or recession, which translates into no financial resources. Even worse projections for world population suggest finite resources will be stretched even further. As impassioned demands for programs and methodology grow, efforts of environmental educators attempt to stave off an impending disaster. Many of us have taken up the task of engaging students in the investigation of human influence and interaction with the environment. In some jurisdictions such as British Columbia environmental education is not even formally addressed in mandate curriculum. This is our dilemma: we face growing expectations, societal needs and anxious public queries at a time when financial resources in a traditional sense, especially for the public sector have been capped, reduced or withdrawn completely.

At the North Vancouver Outdoor School we've had to face this dilemma head on. We have not been free from these socio-economic pressures. Successes which we may have had during these times developed because we changed as the conditions changed, without abandoning our mandate. Our adaptations were self imposed, external influences caused them to happen just as external influences shape adaptation and evolution in natural systems. We planned for a potential deficit economy and took some actions before the major crunch of the last few years. These actions helped us survive and perhaps thrive in spite of the economy. By no means do we have all the solutions and we are not free from extinction; no dynamic system ever is.

Context

Outdoor School was established in the fall of 1969. The school grew out of the late 1960's movement of "back to the land" and a search for holistic educational experiences. Its programs have always been residential for all ages. Teachers bringing their students have always taught concurrently with specialist teachers at the school. Today Outdoor School has 30 staff that hosts 5,000 students and 4,000 private guests annually.

Like many outdoor centers the school's beginnings were based more on recreation than environmental education. Curriculum quickly integrated natural sciences with outdoor recreation. This development is not surprising considering that natural gifts on the school's 165 hectares (420 acres) include salmon spawning channels, a grove of 1,000 year old red cedars and the wintering site for the second largest concentration of bald eagles in North America.

Consolidation

In 1980 key actions were taken which helped to consolidate the school. The school district decided to purchase rather than lease the land and facilities in Paradise Valley close to Squamish, BC. This acquisition was made possible through a partnership with a philanthropic society, the Vancouver Foundation. The society purchased the land and facilities and the school district entered into an agreement to buy it back with interest over a 20 year period. The district gained ownership, both physically and financially of the Outdoor School, while the Vancouver Foundation fulfilled its community building mandate. This assistance by the Vancouver Foundation helped recognize the school's regional significance.

Ownership was imperative to the subsequent evolution of the school because it helped foster a sense of self determination. The school started to define its character. In partnership with the National Film Board of Canada a video was produced in 1982, identifying the school's unique educational impact and burgeoning regional importance. For the first time participatory experiences, as well as investigation of human impact in the environment, were formally presented as objectives for the school. Education at the school was described as being linked to something more than book learning alone. This educational focus was built upon in a new Salish cultural immersion program. Public presentations about this program were made at both the NAAEE and Interpretation Canada Conferences of 1988 (Elderton, 1988). Integration of environmental studies through explorations of First Nations culture, natural history and outdoor recreation had become the school's curriculum. Reaffirmation of Outdoor School's philosophy was showcased in the 1993 video, "Seasons: An environment for every learner."

Integration was also reflected in faculty use. By 1985 the Outdoor School was operating its own conference and seminar center. An old mini high school was moved to the site and retrofitted. This conference center tangibly established the school as a center for community use. Over 4,000 people other than school children now run their own programs concurrently while the school continues its main educational function. In 1992-93 approximately $400,000 of conference business subsidized student program costs by 50% and student fees covered the other 50%. This self sufficiency made it possible to maintain programs and staff without competing within our own district for limited funds.

As this financial independence became more prevalent through the 1980s, profits remained under the control of Outdoor School. Since 1985 Outdoor School has been able to improve infrastructure, such as, electrical service upgrade, sewage system integration, a second complete water system and various roofing upgrades. Now as we face the reality of deficit economics we do not have to deal with failing infrastructure.

Consolidation meant Outdoor School clearly identified its mandate, integrated curriculum and facility use, gained control of its own usage and financing.

Constituency

Consolidation evolved at the school and became its foundation. It was made possible by the supporting efforts of its constituency. Many environmental educators have felt that their program has made an impact. Translating that impact into a tangible body for advocacy and action is not often done. Effective advocacy and action can't be imposed.

Students often have the potential of forming supporting groups. Since 1987 alumni were encouraged to become active partners in school operations which led to the formation of their own non-profit society. The North Vancouver Outdoor School Alumni Society's (NVOSAS) purpose is to support student activities associated with the school. The "Outdoor School for Kids Bursary Fund" covers the program expenses of all financially disadvantaged children. NVOSAS also acts as an independent advocacy, promotional, and school advisory group.

The use of North Vancouver Outdoor School for community functions and programs has improved public awareness, profile and exposure. Most importantly this usage, which can be outside of the school's specific mandate, has generated requests that the school develop new environmental programs. Environmental studies are integrated with a visiting group's program or are offered separately. This work further expands our expertise, diversifies our instruction and supports development additional experienced staff.

Recently, growing out of both community use and alumni interest, a corporate group is considering capital fundraising for school facilities and projects. Though it is unclear what the work of the Foundation for Understanding Nature might accomplish, its potential in creating extensive partnerships and expanding Outdoor School's regional environmental education impact is great. These partnerships will enhance our recognition, through a constituency outside of our traditional realm.

Commensalism

Outdoor School's evolution built upon the foundation of its consolidation, strengthened by the support of its constituency, is diversified by commensal relationships. As early as 1975 a number of joint projects have include government and nonprofit agencies. Remember, the purchase of the school was a joint venture of mutual benefit. Other jointly developed ventures include: barn, poultry house and pig pen with Katimavik; salmonid hatchery and spawning channels with the Save the Salmon Society, Coho Festival and Federal Department of Fisheries and Oceans; forest field study pavilions with the Canadian Council of Forest Ministers; and Salish Bighouse and Skw'une-was cultural immersion program with the Secretary of State. These projects are in daily use and co-sponsoring agencies have gained benefits which meet their mandates.

While past projects have mostly been capital improvements, future projects focusing on long term partnerships will serve as a means to make Outdoor School a site for numerous groups. Visiting, resident and volunteer staff will be exposed to new perspectives, viewpoints and information. Outdoor School has already been used by professionals from university and government especially in fisheries biology, ecology and education.

Conclusion

Outdoor School has evolved into a greenhouse. It stands on a foundation independent yet attached to the earth. Its framework though substantial continues to be strengthened, but remains fragile. Energy from the surrounding environment enters and "hothousing" of environmental education endeavors occurs inside, where programs germinate, grow, cross pollinate, and die. However like a greenhouse we must remember, Outdoor School's existence can never be completely assured.

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National Network on Agriculture in Environmental Education

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Introduction

Historically, agricultural education has been viewed by school educators as "how to" or vocational education. The number of schools with vocational agriculture curricula has dwindled sharply over the past few decades. Today the subject of agriculture in schools, though still largely associated with the tradition of vocational agriculture, has begun to attain a new meaning and purpose. Terms such as "agri-science", "agro-ecology" and "agricultural literacy" denote new conceptual frameworks.

The concept and importance of agricultural literacy was captured in a National Research Council (National Academy of Sciences, 1988) report, entitled "Understanding Agriculture--New Directions for Change", which indicated that most urban dwellers do not have a clear understanding of the relationship between society and agriculture. "An agriculturally literate person's understanding of the food and fiber system includes its history and current economic, social and environmental significance to all Americans. This definition encompasses some knowledge of food and fiber production, processing, and domestic and international marketing."

Several researchers in California (Rilla et al, 1990) examined teacher and administrator perceptions of and desire for agricultural education. Their findings point to stronger educator concern for resource/environmental issues--toxics, water, soils--than for commodity and production issues. They found that teachers and administrators thought agricultural literacy to be an important part of education. Another survey of teachers visiting four farm educational settings in California recorded a high preference for science, ecology and conservation curricula and only a moderate interest in farm history and agricultural practices (Jorgensen, 1991).

During the past decade USDA, Farm Bureau and the farm industry have collaborated to produce programs titled "Ag in the Classroom" as a means for developing a society literate about agriculture. Varying widely in subject matter, the curriculum was often limited to commodity and animal identification and production practices while lacking in science, environment and historical concepts. This has begun to change with new material such as "Food, Land and People".

Science literacy is recognized by educators and public as an area of national concern and priority. Some educators are integrating agriculture, natural resources and science into new "agri-science" programs. Programs emphasize hands-on life science experiments exploring biological and ecological principles. There are also increasing numbers of environmental educators who are utilizing agricultural settings for teaching children ecological and environmental relationships (Jorgensen, 1989). Agricultural practices illustrate ecological principles and conservation practices (or their breakdown) in food and resource terms with which urban audiences easily identify and understand. Agro-ecology describes educational programs examining long-term research issues of sustainable, ecological agriculture. Instruction focuses on the relationships between plants, soils, climate, insects, and pathogens. Programs examine agricultural practices which emulate natural systems. Sustainable production systems are modeled on ecological understanding.

Agricultural literacy, agro-ecology and agri-science programs are all integral part of environmental education. Agriculture provides a thematic instructional approach integrating environmental knowledge into existing school academic subjects without further overcrowding of required instruction. Farm centers provide the laboratories for helping urban youth understand environmental relationships and the requirements for sustainable stewardship air, land and water.

Developing a Network

To increase communication and sharing of ideas and resources amongst farms, parks, schools, museums and other educational settings that utilize agriculture for environmental understanding, the following goals were undertaken.

- Development of a national list of non-formal agricultural education sites promoting agricultural literacy, science and environmental understanding.
- Identification and sharing of unique programs and educational practices.
- Identification and sharing of resources--curricula, journals and educational associations--providing information strengthening programs of instruction.

To accomplish these goals the author searched for site listings and then visited many of the educational sites during the spring and summer of 1992. Site visitations included interviews with program directors, observation of program practices, and photographic and written documentation on each of the goals.

Identification of Agricultural Education Centers

Sites and programs integrating environmental and agricultural education are scattered around the country with no formal association or organization linking them together. Locating centers is difficult. Some sites are affiliated with the Association of Living Historical Farms and Agricultural Museums, others with regional environmental education associations, and a few with Future Farmers of America. The Directory of Natural Science Centers, and listings from the American Camping Association and the North American Association of Environmental Education produced some leads. A literature search (environment-agriculture, environmental centers, farm education) produced a leads. The best source for locating centers was a search of job information bulletins such as Job Seeker (Wisconsin), Environmental Opportunities (New Hampshire), Earthwork (New Hampshire), and Environmental Employment Directory (California) which described active centers and programs with agricultural components.

The sites vary enormously in resources, personnel, program objectives and success in conveying their stated goals. Sites were briefly described in terms of goals, unique program attributes and facilities. A directory of sites was compiled. A site questionnaire would be appropriate an appropriate follow-up tool providing fuller organizational descriptions.

Unique Programs and Educational Resources

Farm center educational practices were observed and recorded and curriculum resources and methods described in interviews with program directors. Some of the outstanding educational practices and resources are described in a resource guide. Unique farm program descriptions include:

- animal science programs where animal husbandry practices--feeding, birthing, vaccinating, worming, etc.--are hands-on laboratory processes with children;
- plant science programs--one acre forestry regeneration demonstration plots, 4'x10' planted beds illustrating various cropping patterns and erosion run-off, and orchard management illustrating insect trapping, mating disruption and beneficial insect attraction; and
- a multicultural program illustrating plant and animal origins along with cultural practices (Native American, European, Asian and African).

The section on educational resources describes curricula, journals and organizations which provide diverse insights into agriculture and environmental relationships. The curricula resources are hands-on, experimental science processes and ecological investigations. The journal sources are intended to expand reader perceptions of issues and solutions.

Summary

The resource guide is designed to expand the use of agriculture as a medium for environmental education. It's goal is to increase communication and sharing amongst farms, parks, schools, museums and other education settings that utilize agriculture for environmental understanding. The guide identifies a few exemplary programs and curricula, and shares a directory of "teaching farm" organizations. Copies of Agriculture and Environmental Education: Non-Formal Education Resource Guide, may be attained by writing the author. The guide provides an important first step in establishing a national network on agriculture in environmental education.

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A Marketing Approach to Promoting Environmental Education

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To many people marketing means about the same as advertising or selling. In actuality advertising and selling are only a portion of the marketing process. A more acceptable definition is the performance of activities which seek to accomplish an organizations objectives by anticipating customer or client needs and directing a flow of need-satisfying goods and services from producer to customer that also accomplish the goals of the organization (McCarthy, 1981). Marketing is based upon the concept of conducting business in a manner that is based upon a customer needs orientation backed by an integrated planning effort aimed at satisfying customers that make up many different target market segments. The marketing concept is made up of three parts. First is the design of programs, products, or services to meet customer needs and desires. Secondly, under a marketing concept the focus is on specific market segments rather than using a generalize approach toward the entire market place. Finally a marketing concept demands that an integrated mixture of products, pricing, location decisions, and promotion.

Although market planning for environmental education is different from marketing commercial products such as cereal and toothpaste, the principles employed remain the same. The product provided in environmental education is primarily a service to the public and as such is somewhat intangible. Service based products are more difficult to evaluate and quality control can be a problem in the evaluation phase of the planning process. To adopt a market planning strategy in the environmental education arena means a supplier must embrace a strong customer orientation and must regularly research customer wants, needs, and attitudes.

A market plan as a document consists of nine major parts: 1) a set of written objectives; 2) an inventory of your resources and abilities; 3) an inventory of potential markets; 4) determination of target markets; 5) objectives for each target market; 6) determination of the appropriate marketing mix; 7) an implementation plan; 8) a budget for implementation; and 9) an evaluation procedure.

The overall and target market objectives of a market plan should provide the planner with quantifiable standards by which to measure success. They are not to be confused with goal statements which give general guidance to the organization. For example an environmental education center might choose as an objective to increase the number of adult education program participants by five percent per year for five years. This is an objective which can be evaluated periodically to determine if there has been satisfactory progress toward the objective.

The in house inventory of resources is critical to success in market planning. It should not be assumed that everyone already knows all about your facilities and staff. This inventory often reveals hidden strengths and resources that had previously gone unnoticed. It serves as the basis for future expansion and plays an important role in market segmentation and selection. Factors which you should consider include: 1) the type and quality of facilities; 2) the type, quality and history of services offered; 3) staff size and abilities; 4) your current public image and; 5) current consumer satisfaction with facilities and services. Once completed this inventory should give you an awareness of market position and relative strengths and weaknesses relative to competition.

The inventory of potential markets is the first step in market segmentation. There is not just one large mass audience, market, or public. There are many different segments within the public and you must group individuals that have similar needs or service requirements together. Segmentation can be done the basis on many different criteria ranging from age to educational interest. Some segments should be obvious based upon current consumers, but be creative in perceiving other market segments. However, current customers are the best indicators of what you do well. Determine what segments of the population they represent and consider marketing strategies that will increase your share of current markets.

Once the inventory of segments is completed the most desirable segments should be selected and market mixes of product, price, location, and promotion designed to accomplish your objectives for each target market. There are several questions that should be answered in evaluation of potential market segments. Does the segment fit within the organizations objectives? Is it big enough to merit your efforts? How much competition is there for the segment?

Do your existing resources match up with the segment's needs? Can you furnish the marketing mix that will attract and satisfy the target consumers? How much will it cost? Careful selection of target markets is the core of the marketing plan. Look carefully before you leap!

The marketing mix, traditionally defined as the four P's, product, place, price and promotion should be seen as the combination of products and services offered to attract and serve customers.

The first consideration in the market mix is the product to be offered. Decisions on the educational programs or services to offer should be based upon the needs and desires of the targeted consumers. They should not be based upon the preferences of the directors or staff. Many programs fall into the trap of offering the programs they can easily provide or those they enjoy providing instead of first considering the consumer. Much environmental education is experientially based and it must be recognized that the experience is not limited to the activity you provide on the site. It will continue as long as the experience is remembered. Product decisions should be based upon this premise. It is not just an activity you are providing. It is an experience that may impact the visitor for years. Focus planning on the experiences desired by the customers and the facilities, programs and staff necessary to supply those experiences.

The place or location of your program offering is also important. Your location in respect to potential markets is critical. Distance and time of travel help determine the nature and extent of program offerings. Travel distance is limiting in many forms of environmental education due to cost and time limitations. Programs that are shorter than the round trip travel time are usually doomed to failure. Often location in relation to the target market is more critical that the natural and built resources on the site. Pricing decisions are among the most difficult in the planning process. Often the role of pricing in determining the market mix is under estimated. Some common errors in pricing include: 1) determining a price with inadequate information concerning the cost incurred in designing, producing and delivering the product or program; 2) failing to regularly evaluate your costs and pricing structure; 3) basing your price solely on competitor pricing; and 4) failure to recognize the relationship between price and perceived quality of product. Price structure is an excellent market segmentation tool. Some consumers are price conscious while others are more concerned with product quality or convenience. Remember, that "free" is also a pricing decision, and as such will impact your market mix, and target market selection.

Promotion is the means by which you inform target market segments of the products and services you offer, and helping them to decide whether or not to participate. The four basic types of promotion are personal selling, advertising, publicity, and incentives. Personal selling is the face to face contact between consumers and employees or staff of the facility. It is critical that employees understand the need for hospitality and friendly behavior at all times. Advertising is simply paid information dissemination activities. It is normally associated with mass media. Recently bulk mailings have become popular because of the availability of address list that have been presegmented. Publicity is utilization of public media to disseminate information without direct costs. To gain good publicity you must have a newsworthy event or information that is attractive to the media and its audience. Incentives are activities designed to stimulate sales or program attendance by making special pricing offers or other benefits for attending the program.

Budgeting and implementation go hand in hand. Many good marketing plans are never fulfilied due to lack of budget or because they are simply filed away to be implemented some time later. All the planning in the world will not help your organization if you are not dedicated to implementation, and if you fail to budget specifically for the implementation of the plan.

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33 States, 15,000 Miles and 111 Days Late--An On-site Survey of 26 Environmental Programs Across the USA in the Fall of 1992

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Introduction

As a new coordinator and a newcomer to an unfamiliar discipline, I needed to find out what is going on elsewhere under the broad umbrella of environmental programs, and who is doing it. The most interesting, exciting and personal way to do this is to make on-site visits.

I got a membership list from NAAEE, and not knowing who all the movers and shakers were in this arena, I arranged a cross-country trip that would give me a sample of programs in environmental education, environmental studies and environmental science. Armed with those chosen stops, a sabbatical leave and a grant from our college, my wife and I made a 15,000-mile, 111-day trip through 33 states to visit 26 sites.

The survey included 13 public and 12 private schools/sites and one federal agency (TVA). Five off-campus nature-center type operations were visited. Nine graduate, seven undergraduate and nine combinations of undergraduate-graduate programs were surveyed.

Once I made on-site contact, everyone was generous with their time, information and materials. It was through these personal contacts that the intangibles of commitment, urgency, occasional despair and disappointment, purposes, plans, visions, hopes and other insights into the personalities and programs were gained. They could never be obtained in any other way.

Some Commonalities

Some of my 18-20 questions did reveal some common practices, adding to my learning experience.

1. Every program depended on allocations from the general budget, whether that budget was generated from state or private funds and/or tuition.

2. Some schools used part-time faculty or adjunct professors and/or local experts as guest speakers to add breadth and depth to topics.

3. Very few schools had a required summer program, though many offered selected courses for students in the program. Some students spent part or all of the summer on requirements such as workshops, training sessions, internships or research that counted toward the program.

4. Every school was keen on opportunities for practica, tutorials and internships (getting practical experience). Most had more requests than they could fill. Though schools differed in terminology and credit given (usually 3-4 hours of work per week for one hour of credit), most permitted students to receive both credit and a stipend, if available. All schools required some kind of a report at the end of the work experience, usually scientifically written.

5. Most schools with a Master's degree that would provide graduates for interpretive positions expected them to gain that skill by experience through another class requirement or on an internship or practicum, rather than an interpretive skills course.

6. In general, staff specialists were in the areas of emphasis of the program; i.e., if environmental education were the emphasis, the faculty were education specialists. If environmental technology were emphasized, the faculty were science specialists from a variety of departments. Both areas drew upon the social sciences and the humanities by using existing courses and their faculty. Environmental education programs were trying to strengthen the scientific portion, while environmental studies programs were trying to enhance the non-sciences. Few schools had more than one or two faculty positions assigned specifically to the program, its advising, curriculum and execution.

7. Each school had a unique approach to preparation of professionals, influenced by clientele and the area. Each school was serving its region and the movement to the maximum of the ability of the leader, the faculty and available funds.

The focus was to get students involved locally and not try to change the world.

Some Conclusions

These conclusions may not be new to "old-timers" in the movement, but they were to me as a newcomer. First, I share some observations I considered conclusions.

1. The success of every program is due to its leader. No one is in these programs because they have to be. They want to be. Every one of them conveyed a strong sense of commitment to the understanding, protection and restoration of the environment, and urgency in conveying that commitment to others.

2. Specific characteristics I sense are energy, enthusiasm, dedication, drive, determination, involvement, vision and decisiveness.

3. The unfortunate aspect is that half the directors will retire by the end of the decade. If the current nationwide cutbacks in higher-education positions and programs continue, these positions and programs may be in jeopardy.

4. Every leader is very busy, involved in many activities besides teaching, and every office reflected that. All are overloaded in teaching and advising with too many advisees and not enough time and help, and they see no way out!

5. Financial restraints and cutbacks have generated what I sense as a discouraging and demoralizing atmosphere. Many have been with the movement since its beginning, and think it is just getting up to speed.

6. Few are deeply involved in research and if they are, it is in environmental sciences in their specialties. Most are supervising students doing research or projects as part of their programs.

7. Private schools have the most flexibility and the autonomy to make changes quickly and opportunistically, because they usually lack the "excess baggage" of "turf", egos, politics and policies that pervade public higher education (and lots of other places).

8. Each school is unique and not a clone of another. Each serves its own region of the country without visions of becoming a national center. Some have an education emphasis, others a technology emphasis. A few are trying to meld those two lines. All are trying to incorporate practical experiences into the learning process.

Other conclusions from the interviews are:

1. There seems to be a prevailing movement to get scientifically-oriented programs more socially attuned, and to get educationally-oriented programs more scientifically attuned. Every school is trying to balance science and non-science course requirements or options. Some schools are also increasing the number of both science and non-science courses required in their programs.

2. Because more students want to address environmental issues and bring about change through the political arena, the need to educate for the procedures and practices of politics, decision-making and management skills is becoming apparent. The urgency for educated input and influence in such processes increases with the complexity of the problems and the necessity for educated courses of action. It is to the political arena that society and these program leaders look for governmental commitment to setting goals and taking positive steps on behalf of the environment.

3. Many individuals, schools and states are trying to find a way to make environmental education an integral part, if not the integrating theme, of K-12 curriculum, thus developing environmentally literate future citizens, along with all the other skills required to function in our fast-changing world.

4. There is a definite trend within the movement toward expanding our national horizons and increasing global awareness and involvement.

5. Different angles are being tried to make programs more relevant, current, available and meaningful to the clientele.

6. All sense a need to cooperate, share and build together more fully around common goals. Having time, energy and to some extent, money to do so are limiting factors.

7. Though remarks leading to this conclusion are not explicitly expressed or discussed, I sense that the thrust of environmental programs is moving from just educating on the appreciation and understanding of nature toward encouraging and promoting activities that bring about protection and restoration of the environment.

8. The last conclusion should go without saying, but...in spite of noble efforts and successes of these programs, many leaders are apprehensive about adequate funding and the assured survival of programs in this era of downsizing and retrenching. The opposite should be happening, because society desperately needs the products of these programs, whether the products are people, skills, ideas, leadership, training grounds, research, studies, information, strategies, goals and direction, or others, present or future.

In closing, directors are very sensitive to the pulse of the movement and the academic, political and public atmosphere as they continue to try to keep abreast of the needs of the profession, and as demands for such knowledge and skills skyrocket. Yet, with all the success to date and optimism for the future, uneasiness prevails as we await some type of grassroots movement or state or federal leadership and commitment to the cause of the environment and environmental education.

I was impressed with the commitment of faculty and programs to provide meaningful options for students to prepare to be competent, capable professionals.

My investigation was an encouraging experience and achieved my objective of becoming better informed. Yet, all of us seem to sense that the course of events in the next few years will undoubtedly produce another turning point in the movement. Which way and how far obscure the horizon.

Finally, there is a lot of beautiful country and there are a lot of beautiful people out there to benefit from environmental programs and professionals, so we must keep the long green line growing.

Phillips Environmental Partnerships--PEP

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Introduction

In 1991 Phillips Petroleum Company learned that many states were mandating environmental education in the public schools--without allocating funds to implement programs. Teachers had few financial resources available to create and implement hands-on environmental education projects. In response to this need and a desire for a unique program that: 1) encouraged grassroots environmental initiatives; 2) encouraged partnerships; and 3) had an educational component, Phillips reviewed various options. Phillips decided to conduct a national competition to provide seed-money to K-12 schools, youth groups and adult nonprofit community groups, to would enable good environmental ideas to become reality.

Once the broad guidelines for Phillips Environmental Partners (PEP) were developed, Phillips turned to the Center for Environmental Education at Oklahoma State University, for help in establishing a Request for Proposals (RFP) and to critique the proposals. Following the cooperative development of the RFP, the PEP project was announced in September 1992 with a January 15th, 1993 deadline for receipt of proposals. In addition to the thousands of announcements mailed by the Office of Corporate Affairs at Phillips, the Center for Environmental Education (CEE) mailed 2100 RFPs. A description of the RFP was also announced: 1) on Econet and American On-Line electronic mail networks, 2) to 250 Environmental Education Centers across the nation in the National Environmental Education, *Network Exchange* newsletter, and 3) through personal contacts with individuals who are part of national networks.

The following describes the: 1) overall response to the PEP proposal solicitation; 2) the proposal review process; 3) composition of the proposals recommended for funding; and 4) 1994 request for proposals information.

Overall Response to the PEP Proposal Solicitation

The PEP project broke new ground with the notion of funding school-based and grassroots projects to make local communities a better place to live. Communities across the nation reacted to the request for proposals with a resounding positive response. Every state in the union, as well as Puerto Rico, wrote at least one proposal designed to improve the quality of life in the local community. Table 1 summarizes the number of responses and the amount requested by category.

Table 1
Responses to Request for Proposals

Grand Total	Number	Amount Requested
Applications	902	$3,610,160.93
States*	51	
Schools	595	$2,405,252.50
Elementary Schools	359	$998,491.22
Middle Schools	189	$538,169.57
High Schools	209	$609,364.19
K-12 Schools	65	$178,248.69
Private Schools	29	$107,563.33
School Youth Groups	41	$124,916.50
Civic Groups	283	$1,127,306.36

*Note: This includes proposals from Puerto Rico

Proposal Review Process

A total of 902 proposals were received. Five hundred ninety-eight proposals met the criteria for review. Reviewing such a large number of proposals required the assistance of a Proposal Review Panel (PRP). The PRP was comprised of 28 professionals with an expertise in environmental education and community projects. On February 13th, the PRP met to review proposals. The review was initiated with an overview of the PEP project, discussion of the criteria, and judging process. Proposals were critiqued on a one-to-ten scale for each of the following seven criteria:

1. Does the proposal offer an innovative/creative approach to meeting a local environmental need?
2. Does the project impact a significant number of people?
3. Can the project be completed in one year?
4. Is the project cost effective, making the best use of materials/ equipment that are easily available/inexpensive?
5. Does the budget detail specific use of funds?
6. Does the proposal have widespread community support?
7. Is the program sustainable?

Each proposal was critiqued by two reviewers whose scores were then averaged. Three hundred and seventeen proposals did not follow RFP guidelines and were declared ineligible (See Table 2).

Table 2
Proposals not meeting RFP Criteria

Reason Number		Amount
Request too large	20	$162,960.22
Request too small	2	$625.00
Unspecified Use of PEP Funds	168	$746,430.00
1 Copy	124	$477,481.22
Ineligible Organization	3	$8,610.00
Total Ineligible	317	$1,384,051.14

From this process 73 proposals were recommended for funding (See Tables 3, 4 and 5).

Table 3
Proposals meeting RFP Criteria

Number of Projects	587	$2,226,109.79
Number of States	48	
Mean	49.58	

Table 4
Proposals Recommended for Funding

Number of Proposals	73		$239,259.55	
Mean	64.98			
Number of States	35			
Group Type	Number	Percent	Amount	Percent
Civic Groups	21	29%	$63,302.50	26%
Schools	52	71%	$175,957.05	74%
School Type				
K-12	6	12%	$23,900.00	13%
Elementary	26	50%	$82,114.82	47%
Elementary/Middle	3	6%	$ 5,141.40	3%
Middle	7	13%	$24,745.48	14%
Middle/High	3	6%	$10,958.35	6%
High	7	13%	$29,097.00	17%

Table 5
Summary of Proposals Recommended for Funding

State	Receive	Reject	Review	Fund	Amount
Alabama	11	2	9	2	5,150.97
Alaska	2	0	2	1	4,153.44
Arizona	7	2	5	2	9,900.00
Arkansas	13	6	7	1	4,819.00
California	40	16	24	2	7,150.00
Colorado	15	4	11	2	6,500.00
Connecticut	14	5	9	2	7,500.00
Delaware	9	2	7	0	0.00
Florida	16	0	16	3	11,855.00
Georgia	24	8	16	1	5,000.00
Hawaii	9	2	7	1	1,500.00
Idaho	9	4	5	2	9,960.35
Illinois	28	11	17	2	7,749.00
Indiana	45	21	24	5	15,423.70
Iowa	33	14	19	0	0.00
Kansas	13	4	9	0	0.00
Kentucky	17	7	10	2	7,359.00
Louisiana	22	6	18	1	2,150.65
Maine	8	2	6	0	0.00
Maryland	9	4	5	1	4,998.00
Massachusetts	15	4	11	0	0.00
Michigan	38	11	27	4	13,495.00
Minnesota	44	19	25	5	23,270.00
Mississippi	10	3	7	2	6,195.00
Missouri	28	7	21	1	1,000.00
Montana	2	2	0	0	0.00

Table 5 continues . . .

Table 5 continued

State	Receive	Reject	Review	Fund	Amount
Nebraska	14	5	9	1	500.00
Nevada	6	3	3	2	6,993.00
New Hampshire	4	3	1	0	0.00
New Jersey	7	2	5	0	0.00
New Mexico	10	2	8	0	0.00
New York	37	13	24	3	10,875.00
North Carolina	5	1	4	0	0.00
North Dakota	3	1	4	2	2,792.50
Ohio	27	10	17	1	5,000.00
Oklahoma	51	24	27	4	6,165.00
Oregon	6	2	4	1	3,400.00
Pennsylvania	26	8	16	1	5,000.00
Rhode Island	1	1	0	0	0.00
South Carolina	14	1	13	1	4,341.40
South Dakota	1	1	0	0	0.00
Tennessee	14	8	6	0	0.00
Texas	77	31	46	3	5,739.54
Utah	13	7	6	1	2,000.00
Vermont	2	0	2	0	0.00
Virginia	14	3	11	2	3,202.00
Washington	26	6	20	4	11,938.00
West Virginia	1	0	1	0	0.00
Wisconsin	47	12	35	4	11,300.00
Wyoming	7	4	3	1	4,884.00
Puerto Rico	3	0	3	0	0.00
Total	902	317	587	73	239,259.55

1994 RFPs

Phillips Petroleum Company has committed $250,000 to the PEP program for 1994. RFP guidelines for grants ranging from $500 to $5,000 are now available. Those eligible for grants are primary and secondary schools, adult non-profit community organizations and nature centers. Proposals require a postmark deadline of December 15, 1993. Notification of awards will be in March, 1994.

If your school, adult non-profit community organization, or nature center has an idea that could help your community environment, you may wish to submit a proposal. A RFP may be obtained from Phillips Petroleum Company, PEP Program, 16 D1 PB, Bartlesville, OK 74004. The PEP project believes that the best way to help the environment occurs when people work together to address their communities unique needs and problems.

Environmental Coalitions in an Australian Context--New South Wales

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Australia is an extremely diverse island continent. The vastness of its interior gives an untamed and unforgiving impression to the visitor, and in an educational context, provides an array of communication and isolation problems. Two thousand, four hundred miles from east to west, area of 2,967,909 sq. miles with a population of 17 million compares to the United States—2800 miles across, an area of 3,675,911 with population of 250 million.

Our State of New South Wales lies on the eastern side of our continent and ranges in topography from a scenic coastline, famous for its beaches and surf, to the Great Dividing Range (the closest thing we have to a mountain range), to the arid interior. The diversity of our state is shown by this transect, where we can see rainforest areas to the north, mountain Eucalypt forests of the Great Dividing Range, the woodlands and grasslands of the Central Western tablelands, to the arid and expansive Western plains. Our two largest rivers, the Murray and the Darling, running predominately through New South Wales, have a basin which crosses the boundaries of four states and covers approximately two million square kilometres, or an area equivalent to France and Spain combined. This basin is very important, linking closely to our environmental education (EE) programs. Many of our EE teaching resources focus on our role within the catchment and the need to live in harmony with this great natural feature.

The focus for N.S.W.'s EE is the environmental education curriculum, developed as a Policy Statement and released into our state education system in 1990. This came about after many years of development by interested personnel, both within and without the Education system. A situation occurred where several very pro-environmental education Ministers for Education followed each other into power. These "visionary" educators saw a need for a mandatory policy statement and worked to push it through a system which had previously shown a lack of enthusiasm. In a manner of speaking, the EE Policy Statement has legitimized what "we" have been attempting in our EE teaching over many years. Has it been the case that there has been an infusion of EE into existing curricula areas or rather, an infusion of the Key Learning Areas, or Broad Curriculum groupings, Sciences and Arts into an overall EE curriculum.

The staff of the Wambangalang Field Studies Centre and the other 18 N.S.W. Field Studies Centres have played a prime role in promoting this EE Policy Statement by way of providing practical guidance in the implementation of EE, teacher development and training as well as promoting relevant support material for the EE infusion into all syllabus areas. From these Centres, EE programs and resources are disseminated to each Region's schools, tertiary institutions, government bodies and other interested agencies.

Each regional EE network is unique and acts independently to other regions depending upon each region's particular needs. In Western Region our specific needs revolve around the aspect of isolation and diversity; isolation by way of geographic location and diversity by way of geomorphology and land use. This means our primary role, as well as producing relevant resource material, is to try to reach more schools and more students over a wide geographic area. For Wambangalang, the out camp program is one such strategy, and the targeting of specific curriculum areas to produce field work packages has been another. For example, in biology, the study of aquatic and woodland ecosystems; in geography, the study of dryland salinity and river algal blooms; in history, the Cultural Heritage study of a pre-invasion aboriginal perspective and of European settlement and change; and in agriculture, a look at land use practices and their consequences; and in English, an encouragement for teachers to take their students out to experience the environment.

In Western Region we have developed a task force of educators and representatives from government bodies and organisations which have an interest and role in EE. By bringing together each of the Departments and agencies and the practical educators, we have now a handle on what each group is attempting in their resource production and we can assist with effective implementation and structuring of the resource as well as alleviating a lot of duplication of previously produced and "up and running" packages, thus monitoring the use of valuable resources of time and dollars.

For many years these agencies have been trying to put across their environmental message to the community through various strategies. They now realize that to do this effectively they need to concentrate on finding out into which curriculum niche their message fits. Representation on the task force comes from an extensive array of available government institutions.

In the past three years this representation has been responsible for many relevant resources being produced. The following shows the diversity of interest areas and resources developed:

Department of School Education

- EE school-based policy development program
- Historical built environment National Trust package
- Cultural Heritage of Western N.S.W. package
- Eco-tourism packages combining Arboretum, Zoo and limestone caves programs
- WREN-Western Region Environmental Newsletter and environmental broadsheet communication strategies
- Keylink (telecommunication system) EE bulletin boards
- Arbor Day and Environmental Expo celebrations

Department of Conservation and Land Management and Its Regional Consultant Working in Schools

- Saltwatch program Years 4-6

Department of Soil Conservation

- Soil testing kit Years 4-8

Department of Water Resources

- Streamwatch program of water quality testing-Years 7 to 12
- Algae Watch-joint schools telecommunication program

Western Plains Zoo

- Mallee Fowl endangered species telecommunication program
- Outback Zoo-Travelling teaching resource

Department of National Parks and Wildlife

- Remnant vegetation education kit-Landcare-Community and Government Coalition
- Landcare in Schools program-Schools and community working together on land degradation issues.

Western Lands Division and Its Rangeland Management Consultant

Environmental Protection Authority

Department of Agriculture

Greening Australia

- Greening of Schools program

The resources produced in the past three years have been able to show a greater relevancy and targeting of specific grade or subject needs. In disseminating these resources we have made use of school contact personnel, workshops and conferences. The school contacts have been identified as teachers having an interest in EE, and these are brought together for evening meetings with representatives from other local government departments. This has tended to forge links between schools and relevant bodies within their own local areas. School contacts are also our mailing list links into schools.

This has also served to bring to the attention of educators all new resources, to publicize them and to trial with motivated teachers. It has served the outside agencies in their Public Relations exercises and solved their years of frustration in trying to get a "leg" into schools and access to the students. This closer networking has ensured a wider audience of enthusiastic trial sites and co-operation.

Implementing and Developing Youth Programs in the '90s

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With the exception of outfitters and guides, the first organized, large scale, outdoor school was Outward Bound School. Outward Bound School started in England in 1941 as a survival and physical fitness school for young sailors. This school proved to be very effective and successful.

During the early 1960's when the Peace Corps movement was in its infancy stages, it was suggested that the European Outward Bound School come to America to help train young college graduates entering the Peace Corps. In 1961, the Colorado Outward Bound School was started with the intentions of preparing Peace Corps recruits to live and work in adverse and poverty conditions. The program was rigorous. The results were instant. Both men and women were getting up every day at the crack of dawn, running many miles and then jumping into a cold stream or lake to start their day. They hiked, rock climbed, cooked their own meals, and lived as basically as one could live in the outdoors. They were pushed to their limits and beyond. They needed to learn about themselves, their limitations, and their abilities. This eventually translated into each student developing his/her own judgment. They would soon be in another country, living in poverty conditions, and having to know exactly how they could survive and still make a contribution. Outward Bound School helped provide them with the skills necessary to do this.

This concept of learning by doing was adopted very quickly across the nation. Today there are five Outward Bound Schools in the United States, two in Canada, and over thirty Outward Bound Schools worldwide. Outward Bound set a precedent for the establishment and implementation of many similar outdoor schools and programs. Today, there are literally hundreds of outdoor adventure education programs in operation.

The main idea behind the Outward Bound experience is that the participant has an opportunity to take immediate control of his/her life. They are placed in a situation where they feel that they are at risk personally, emotionally, and socially. Their personal comfort parameters are pushed to their limit. During this time, they take one step at a time, one day at a time. They are forced to depend initially on the instructor, and eventually on themselves. They must learn to be comfortable while being uncomfortable.

This kind of experiential learning exposure focuses on providing the opportunity for individuals to learn their limitations and abilities. The result of discovering one's limitations and abilities is developing judgment. It is hoped that once a person learns certain skills, these skills can be carried over into the everyday life. It is believed by outdoor educators that once a person has learned something by experiencing it themselves, they will always remember it.

As many of these outdoor programs evolve, it was soon realized what kind of therapeutic effect these kinds of programs had on the participants. Program participants experienced personal growth and learning in a short period of time. It wasn't long until this "risk creation" was being used as a sort of prescription for personal growth and development. This concept was having an enormous effect on just about every population group that was exposed to this idea. This idea of putting people into unfamiliar outdoor experiences was proving successful. Programs emerged for disabled people, women only, men only, war veterans, the terminally ill, professionals, and youth. There seemed to be a special attraction for youth, and specifically for youth-at-risk.

The problems with adolescent youth in America have become very complex with the solutions trailing farther and farther behind. Finding ways of encouraging youth to make responsible and ethical decisions has become paramount. During the last ten years alone, while different approaches have been introduced, the problems relating to youth violence, delinquency, missing and runaway youth, high school dropout, family unity, have been escalating at an alarming rate.

Although adults seem to have a multitude of different strategies and approaches for solving our problems with youth-at-risk, the success rate is low. One key factor in the success of any youth-related program is the idea of fostering an area which interests youth in general. For example, one area of interest which has appealed to many youth for centuries are activities which involve play and fun. In addition, another area which has been attractive to youth in general are those activities that require physical participation.

Most of our outdoor-oriented program in America (i.e., Outward Bound School, National Outdoor Leadership School, Vision Quest, Conservation Corp, Youth Camps, etc.) are designed with this type of prescription in mind and have a good opportunity for success. Unfortunately, many of our outdoor programs today are not as successful as they want to be and do have problems. Why is this? Not enough money, poor management, inappropriate programming, or funding? These are the most frequently asked questions or people wanting to get into the experiential education and risk recreation business. Is it a risky business?

Working with at-risk youth today is difficult and is a challenge. It takes time, compassion and understanding. It is often stressful work for the staff involved and is labor intensive and energy consuming. It is not the type of program that can "run" itself. It takes constant supervision and attention to detail. Liability is a factor. Maximizing quality, well-trained staff, with a keen eye for signs of staff burnout is key.

The primary components of Outward Bound include an initial training phase, a main expedition phase, a solo experience, a final expedition phase, the completion of a high element ropes course, a mini-marathon run, and a community service project.

One ingredient in this type of activity which seems to draw young people is the excitement and the element of risk. Another attraction to this type of activities is the individual control that is exercised during the activity, the newness of the activity, and the self-gratification resulting from the success of the activity. Much of this adds up to a young person taking control of his/her emotions, choosing to participate in an experiential activity, and deriving his/her own satisfaction from it. This means feeling good about themselves, or...self-esteem.

The above-mentioned ideas would seem like enough to keep youth interested and happy. They're not. Many kids want more. Why would a child turn to drugs or crime? Somewhere, his/her needs are not being met. Some areas that adolescents and older teens seem to respond very favorably toward are those areas of empirical learning, adventure education, and risk recreation. "Learning by doing" is what this process is referred to. This type of activity may or may not involve risk, but will most likely require absolute individual participation and involvement.

So why would anyone want to take a handful of troubled youth rock climbing, river rafting, backpacking, or other high-risk outdoor pursuits? The program has a good chance for success when the program is administered properly, the staff selected and trained appropriately, the participants screened adequately, and the program performed safely. Lastly, and most importantly, it works.

When an outdoor risk recreation program is properly designed, thoroughly thought out, with good staff and training, the chances for success are good. An even more important consideration are the participants to whom you prescribe this program. An initial screening is paramount for a successful outcome. When this type of program is prescribed to someone who is ready and receptive, it can work wonders. On the other hand, this type of program should not be forced upon someone, or prescribed to someone, who has emotional, physical, or personal incompatibilities. If this happens, it can be lethal.

The first step to considering a high-risk program such as Outward Bound is to examine existing models that are successful and that serve a similar population.

In conclusion, Outward Bound pushes people to learn their strengths and weaknesses, build on the weaknesses, and take immediate control of their lives by learning to depend on themselves. A positive self-esteem and self-confidence can be a natural result of this kind of program which properly administered. So, is it a risky business? Yes.

EELink--An EE Resource on the Internet

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In 1992, the University of Michigan's School of Natural Resources was awarded a grant from the U.S. Environmental Protection Agency to create the National Consortium for Environmental Education and Training (NCEET). NCEET is charged with improving Environmental Education (EE), specifically in the K-12 arena. One aspect of the outreach that NCEET has begun is to help educators find existing, and new, resources.

During the 1990s, the quantity and quality of materials on the environment for K-12 teachers has increased dramatically. Many resources, however, go untapped. The time it takes to find useful materials discourages many potential users. EELink was designed to help educators locate, and use, these materials.

EELink is an on-line, computer mediated service to distribute documents and electronic data to educators interested in Environmental Education. EELink was conceived to be a single location on the Internet that users could access that would provide access to information collected and produced by NCEET, as well as many other services and documents available on the Internet that might be of interest to Environmental Educators.

EELink is:

1. A computer and software,
2. A collection of NCEET generated materials,
3. A collection of materials provided to NCEET by others,
4. A "gateway" to other resources on the Internet that may be of value to environmental educators.

There are many resources available on the Internet that could be of use to educators interested in EE. One of the difficulties a novice Internet user faces is finding those resources. EELink was designed to help users access materials regardless of where they reside on the Internet. Similar services exist for educational resources in general, as well as environmental information. This is the only service we know that is directly targeted at EE educators.

EELink has many resources. Materials available on EELink generated by NCEET staff include the EE Toolbox as the Success Story collection. The Toolbox is designed primarily for people offering continuing education workshops for teachers, although it also contains useful resources for teachers. Its centerpiece is a teacher trainer manual, which contains orientation materials for those new to environmental education and ideas for expanding existing programs to reach new audiences. These include strategies for teaching environmental education through the humanities, arts and social sciences and a focus on meeting the needs of urban, rural and multi-cultural audiences. Other Toolbox components include: the EE Directory, a resource for teachers developing EE programs in their classroom or school, a database of EE resources, selections of EE literature and sample classroom activities.

NCEET's Success Stories will expose students to the experiences of everyday people who have successfully met environmental challenges in their own backyard. By emphasizing what can be done, NCEET hopes to counteract the gloom and doom that often surrounds discussions of environmental problems. EELink users will have access to the Success Story archive, a collection of stories taken from books, newspaper articles and personal interviews with environmental problem-solvers. As a compliment to the archive, the Success Story Primer will help teachers develop techniques that put students in the shoes of success story subjects. By so doing, students can learn different approaches to environmental problem solving and find ways of taking action themselves.

The EE Toolbox and Success Stories collection are not the only materials NCEET has prepared that are on EELink. A list of upcoming conferences and meetings is available, as are several collections of resources including names and addresses of many organizations, sources of curriculum and curriculum reviews, and a variety of other resources.

In addition to the materials generated by NCEET, EELink offers links to many gophers and other services and datasets available on the Internet.

The Internet is a series of more than 10,000 interconnected computer networks around the world that makes it possible to share information almost instantly. The networks are owned by countless commercial, research, governmental, and educational organizations and individuals. The Internet allows the more than 1.5 million computers and 10 millions users of the system to collaborate easily and quickly through messaging, discussion groups, and conferencing. Users are able to discover and access people and information, distribute information, and experiment with new technologies and services. The Internet has become a major global infrastructure for education, research, professional learning, public service, and business and is currently growing at the rate of about ten percent per month.

EELink is one of many gopher systems on the Internet. The Internet Gopher provides an information delivery system that presents documents and information to a user in such a manner that the user need not know where that information actually resides. Gopher was originally developed by the University of Minnesota

Microcomputer, Workstation, Networks Center to help their campus find answers to their computer questions. It has since grown into a full-fledged World Wide Information System used by a large number of sites in the world. While providing a delivery vehicle for local information, Gopher facilitates access to other Gopher and information servers throughout the world.

Gopher is a client/server system, which means that there are two programs working together to help you find information. EELink is both a server containing NCEET's documents and pointers to other information, and a publicly available client.

If you are presently an Internet user who's computer is hard-wired to the Internet, you should obtain a Gopher Client for your computer. This program will allow you to use many of the features of your own computer to obtain information from EELink the most efficient manner. (You can obtain a Gopher client via anonymous ftp to boombox.micro.umn.edu. Look in the directory /pub/gopher.) Once you have a client, aim it at EELink using the address: *nceet.snre.umich.edu 70.*

If you use dial-up access to the Internet through a local University or other service, there may be a client on that machine. The normal command to run the gopher client and connect to EELink would be: *gopher nceet.snre.umich.edu 70.*

If your Internet access does not provide a Gopher client, we have. NCEET has set up a publicly available Gopher Client. To access it, sign on to your Internet account and give the command: *telnet nceet.snre.umich.edu*, then login as "eelink".

If you don't have access to your own Internet account, you can access EELink by placing a call to one of our numbers in Michigan. Set your communications software for 8 data bits, no parity, 1 stop bit, and to emulate a vt100 terminal. Use your modem to call one of the following number:

(313) 763-6520	1200 baud
(313) 764-4800	2400 baud
(313) 747-3400	9600 v.32
(313) 763-6800	19200 v.32 bis

Wait several seconds after the call is answered and then press RETURN twice.

At "terminal=" type:	*vt100*<RETURN>
At "Which Host?" type:	*um-eelink*<RETURN>
At the "login:" type:	*eelink*<RETURN>

After you sign on, the EELink Main Menu will be displayed. Type the number of the item you wish, or use the up and down arrows to select the item and press RETURN. After you view a document you will be prompted to mail it to an e-mail address or Download to your own computer.

Virtually any communications software will allow you to capture EELink documents as they are displayed on the screen. You can save the information on disk or send it to your printer. If you have an e-mail account accessible via the Internet, you can have the document mailed to that account. You can also use one of several file transfer protocols that allows information to be transferred from one computer to another with an enhanced degree of accuracy. EELink allows you to retrieve documents and files using the KERMIT protocols.

To perform a protocol transfer, go to the desired EELink document. When you are asked to mail it or Download it, enter D. EELink will then let you select a protocol and wait for you to activate the file transfer option in your software. When the transfer is complete, an EELink menu will reappear.

EELink isn't just a machine. It's maintained by people who would like to hear your questions, comments, or suggestions. When you log off, you will be asked if you would like to leave a message for NCEET. The EELink System Administrator reads messages each weekday morning and will respond to you through e-mail or regular mail. Just leave an address.

If you have any questions, or have information you would like to be made available via EELink, please contact us at: NCEET/EELink, School of Natural Resources & Environment, The University of Michigan, Ann Arbor, Michigan 48109. Internet: eelink@nceet.snre.umich.edu

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WINNERS OF NAAEE AWARDS

Recipients of the Walter E. Jeske Award:

1982	Clay Schoenfeld, University of WI-Madison, WI
1983	Harold R. Hungerford, Southern Illinois University, Oregon, IL
1984	John F. Disinger, The Ohio State University-Columbus, OH
1985	David L. Hanselman, State Univ. of NY College of Environmental Science and Forestry, Syracuse, NY
1986	Rudolph J. H. Schafer, CA Dept. of Education, Sacramento, CA
1987	William B. Stapp, University of MI, Ann Arbor, MI
1988	Robert E. Roth, The Ohio State University-Columbus, OH
1989	Lillabelle Holt, University of AK
1990	Edward J. McCrea, U.S. Fish & Wildlife, Arlington, VA
1991	Joan C. Heidelberg, Brukner Nature Center, Troy, OH
1992	Richard Wilke, University of Wisconsin-Stevens Point, WI
1993	Rick Mrazek, University of Lethbridge, AB, Canada

Recipients of the NAAEE Award for Outstanding Service to Environmental Education by an Individual:

1974	Governor Tom McCall, OR
	Mayor Pete Wilson, San Diego, CA
1975	--
1976	Odom Fanning, Science Writer, Washington, DC
	Kay Blackwelder, Atlanta Schools
	Lewis Shelton, Fernbank Science Center
	Philip Greear, Shorter College
1977	--
1978	William B. Stapp, The Univ of Michigan
1979	Glenn Linnert, New Albany, IN
	John Moody, New Albany, IN
1980	Amory Lovins, Rocky Mountain Institute
1981	Thomas F. Williams, Consultant, Environmental Affairs
1982	Richard Dunn, U.S. EPA
	John A. Weeks, Centers for Nature Education, Baldwinsville, NY
1983	Steven E. Landfried, Stoughton High School, WI
1984	Charles A. Hopkins, Boyne River Natural Science School, ON
1985	Paul F. Brandwein, Unionville, NY
1986	--
1987	Charles Roth, Audubon, Lincoln, MA
1988	James Murray
1989	Barry W. Fox, VA State Univ. & Kathy O'Hara, Center for Marine Conservation
1990	Karen Hollweg, Denver Audubon Society
	Edward Radatz, Biology Teacher, Oak Park, IL
1991	David C. Engleson, Supervisor of EE, WI (retired)
1992	Judy Braus, Oakton, VA
1993	Lynne Cherry, Washington, DC

Recipients of the NAAEE Award for Outstanding Service by an Organization:

1975	Weyerhauser Corporation
1976	--
1977	--
1978	League of Women Voters Education Fund
1979	Journal of Environmental Education
1980	ERIC Clearinghouse for Science, Mathematics, and Environmental Education
1981	Environmental Education Association of SD
1982	--
1983	Michigan Environmental Education Association
1984	Western Regional Environmental Education Council
1985	National Wildlife Federation
1986	Project WIZE (Wildlife Inquiry through Zoo Education), NY Zoological Society
1987	Kentucky Division of Water
1988	Wisconsin Department of Public Instruction
1989	Tennessee Valley Authority, Environmental Education Program
1990	Alberta Environment, Env'l Ed Branch, Canada
1991	WSMT TV Channel 4, Nashville, TN
1992	Profauna (Protección de la Fauna), Mexico
1993	Boys & Girls Clubs of America

Recipients of the NAAEE Award for Outstanding Contributions to Research in Environmental Education:

1987	Audrey Tomera (posthumously)
1988	Louis A. Iozzi, Rutgers University, NJ
1989	Ted Mills, Oklahoma State University
1990	Thomas Tanner, Boone, IA
1991	Harold Hungerford, Carbondale, IL
1992	Rosanne Fortner, The Ohio State University, OH
1993	Paul Hart, Regina, SK, Canada

Recipients of President's Award:

1988	Bonnie and Bob McCabe, Dade Community College, FL
1989	Joan C. Heidelberg, Executive Vice President, NAAEE
1990	Senator Gaylord Nelson, Father of Earth Day
1991	Dr. Harold Hungerford, Southern Illinois University, Carbondale, IL
1992	Janet Thoreen, NAAEE Administrative Assistant, Pleasant Hill, OH
1993	Andriy Demydenko, EE & Info. Ctr. of the Ukraine

NAAEE PRESIDENTS 1971 - 1993

1971-73	Robert H. McCabe, Miami-Dade Community College, Miami, FL
1973-74	George R. Francis, University of Waterloo, ON
1974-75	Charles L. McKinney, Tarrant County Jr. College, Ft. Worth, TX
1975-76	Arden L. Pratt, Southern Illinois University-Carbondale, IL
1976-77	Robert E. Roth, The Ohio State University, OH
1977-78	James J. Gallagher, Michigan State University, MI
1978-79	Robert Marlett, Texas Tech University, TX
1979-80	John C. Miller, Minnesota Department of Education, MN
1980-81	Clay Schoenfeld, University of Wisconsin-Madison, WI
1981-82	Craig B. Davis, Iowa State University, IA
1982-83	Judith M. Schultz, University of Cincinnati, OH
1983-84	William B. Stapp, The University of Michigan, MI
1984-85	Arthur B. Sacks, University of Wisconsin-Madison, WI
1985-86	John F. Disinger, The Ohio State University, OH
1986-87	William G. Berberet, Willamette University, Salem, OR
1987-88	Edward J. McCrea, US Fish & Wildlife Service, DC
1988-89	Louis A. Iozzi, Cook College, Rutgers, NJ
1989-90	Richard J. Wilke, University of Wisconsin, WI
1990-91	Augusto Q. Medina, World Wildlife Fund, Washington, DC
1991-92	Lori Mann, Coyote Point Museum, Burlingame, CA
1992-93	John Baldwin, Univ of OR, Eugene, OR
1993-94	Lynn Hodges, TVA, Knoxville, TN

SITES & THEMES OF NAAEE CONFERENCES

1972	Hot Springs, AR
1973	St. Louis, MO
1974	San Francisco, CA; Environmental Education: The Challenge and the Commitment
1975	New Orleans, LA; Improving the Quality of Life through the Better Use of Energy and Resources
1976	Atlanta, GA; New Values for a New Century
1977	Estes Park, CO
1978	Chicago, IL; Energy and the Urban Environment
1979	Blacksburg, VA; Environmental Education Today, Tomorrow, Together
1980	Albuquerque, NM; An Environmental Agenda for the Eighties
1981	Kentucky Dam Village State Park, KY; Environment, Education, Technology: Interface for the '80s
1982	Silver Bay, NY; Global 2000: Which Path to the Future?
1983	Ypsilanti, MI; Crossroads: Society and Technology
1984	Lake Louise, AB, Canada; International Perspectives on Environmental Education: Issues and Actions
1985	Chevy Chase, MD; Environmental Education: Progress Toward a Sustainable Future
1986	Eugene, OR; Environmental Education: Transition to an Information Age
1987	Quebec City, PQ, Canada; Excellence in Environmental Education: Gaining Momentum for the Challenge Ahead
1988	Orlando, FL; Building Multicultural Webs through Environmental Education
1989	Estes Park, CO; Working Together to Educate about the Environment
1990	San Antonio, TX; Setting the EE Agenda for the '90s
1991	St. Paul, MN; Confronting Environmental Challenges in a Changing World
1992	Toronto, ON, Canada; World Congress on Environment and Development, ECO-ED
1993	Big Sky, MT; Pathways to Partnerships: Coalitions for Environmental Education
1994	Cancún, QR, Mexico; Collaboration and Opportunity in North America: Energy Through Diversity
1995	Portland, ME
1996	Burlingame, CA

Provincial, State, and Regional EE Organizations that are NAAEE Affiliates--9/21/94

Name of Organization	Address	Phone/Fax	Representative/Title	#Env'l Coms.	Ben. Level	# Mems.	Form Ret'd
FEESA, An Environmental Education Society	9th Floor, 10150-100 Street Edmonton, Alberta T5J OP6 Canada	(403) 421-1497 Fax (403) 425-4506	Jim Martin Executive Director	10	1-Basic		12/19/94
EECOM: The Canadian Network for EE	Station B, PO Box 948 Ottawa, ONT K1P 5P9 Canada	(902) 863-5984 Fax (902) 863-9481	Anne Camozzi/Chair	10	1-Basic		5/31/94
Council of Outdoor Educators of ON (COEO)	1220 Sheppard Ave. E Willowdale, ON M2K 2X1 Canada	(416) 426-7276	Glen Hester President	10	1-Basic	332	7/13/92
AK Natural Resources and Outdoor Ed. Assoc.	P.O. Box 110536 Anchorage, AK 99511-0536	w (907) 234-7616 h (907) 234-7453	Steve Hackett President	10	1-Basic	125	5/12/93
EE Assoc. of Alabama	TSU Box 596 Troy, AL 36082	(205) 536-2882 (w) (205) 883-0560 (h) Fax: (205) 532-1784	Jeff Hughes Treasurer	5	1-Basic	405	1/20/95
AZ Assoc. for Learning in & about the Environment (AALE)	AALE's perm. address (home of C. Williams): 179 W. Kent Dr., Chandler, AZ 85224	(602) 786-9969 Fax: (Nick Pawley) (602) 820-5617	Chris Williams Treasurer	10	1-Basic	734	1/10/92
California Alliance for EE	5050 Laguna Blvd. Ste 112-502 Elk Grove, CA 95758	(916) 684-6131	Betsy Keithcart President	10	1-Basic	16	12/28/94
CO Alliance for EE	P.O. Box 101744 Denver, CO 80250-1744	(303) 297-0187 Fax: (303) 297-0188	Mike Way Acting Exec. Director	10	1-Basic		4/30/93
League of Environmental Educators in FL, Inc.	8581 Kumquat Ave. Seminole, FL 34647	(813) 392-7842	Chuck Parsons/Pres.	10	1-Basic	343	7/22/93
HI EE Assoc.	P.O. Box 1236 Honolulu, HI 96813	(808) 955-0100 Fax (808) 955-0116	Tamar Chotzen/Pres.	10	1-Basic	254	6/5/93
Idaho Society for Energy and EE	604 Town View Road Jerome, Idaho 83338	(208) 324-5960	Richard McCloskey	1		117	1/31/95

EE Association of Illinois	Science Ed. Center 47 Horrabin Hall Western Illinois Univ. Macomb, IL 61455	(309) 298-1961 Fax: 298-2222	John Beaver President (alt.) 309-298-2065	10	1-Basic		5/18/94
EE Association of Indiana	Kosciusko Cty. S. & W.C.D. 217 Bell Dr., Suite 1 Warsaw, IN 46580	(219) 267-5726 Fax: 267-3401	Darci Zolman President until 10/95	10	i-Basic	299	11/30/91
Iowa Conservation Education Council	RR 1, Box 53 Guthrie, IA 50115	(515) 947-8383	Stacey Snyder-Newbrough (alt.) 712-359-2271 712-335-4471 Fax	10	1-Basic		5/31/94
KS Advisory Council for EE	KS State & Extension Forestry 2610 Claelin Rd. Manhattan, KS 66502-2798	(913) 537-7050 Fax (913) 539-9584	John Strickler/Past Pres.	10	1-Basic	160	1/14/94
KY Assoc. for EE	Blackacre State Nature Preserve 3200 Tucker Station Rd. Louisville, KY 40299	(502) 267-8919 (h) Fax (502) 473-8821	David Wicks (alt.) 502-473-3295 (w)	10	2-Intermed.	316	10/85
LA EE Assoc.	2770 Jonquil St. New Orleans, LA 70122	(504) 947-3701	Sue Ellen Lyons	10	1-Basic	152	9/12/91
ME EE Assoc.	P.O. Box 9 Wiscasset, ME 04578	Jim Chandler (207) 743-7019 (w) Fax (207) 743-7047	Jim Chandler/Pres.	1	1-Basic	256	1/9/92
MD Assoc. for Env'l and Outdoor Ed.	10611 Old Barn Road New Market, MD 21774	S.E.:301-865-5272 Britt Slattery/Pres.-elect: 703-358-2504(W) Fax 703-358-2283	Sue Esworthy/Pres.	10	1-Basic	343	10/1/91
MI Alliance for Env'l and Outdoor Ed.	5615 Chickadee Lane Clarkston, MI 48346	(810) 625-2390 Fax (810) 625-8431	Don Place Executive Director	10	1-Basic	300	6/19/92
MN Assoc. for EE	c/o MN Nat. Wildlife Ref. 3815 E. 80th St. Bloomington, MN 55425	MN Nat. Wldlf Ref (612) 854-5900 Fax (612) 725-3279	Jennifer Gasperini President (612) 641-2855 (w)	10	1-Basic	300	8/4/94
MT EE Assoc.	P.O. Box 928 Dillon, MT 59725-0928	(406) 721-5068 After 3/15/95: (406) 994-6425 Fax: 994-1919	Carol Soth/President (After 3/15/95: Gina Morrison, Pres.)	10	1-Basic	242	7/27/94

NE EE Assoc.	P.O. Box 265 Wahoo, NE 68066-0265	(402) 443-4675 Fax (402) 443-5339	Kristen L. Gottschalk/ Pres.	10	1- Basic	153	11/4/92
NV Natural Resource Ed Council	PO Box 28272 Las Vegas, NV 89126-2272	(702) 486-5123 (W) (702) 878-2156 (H)	Chris Chaussel	10	1- Basic	48	10/15/91
New England EE Alliance	P.O. Box 105 Glendale, MA 01229	(413) 528-6455	Linda Garrett (alt.) 802-457-2779 fax: 763-7839	7	3-High	2,430	4/20/92
NH Environmental Educators	394 Surry Road Kenne, NH 03431	(603) 224-9909 Fax (603) 226-0902 Scott Fitzpatrick	Regina Parry President	6	1- Basic	126-unpaid; 99-paid	5/18/92
EE Assoc. of New Mexico	P.O. Box 1523 Bernalillo, New Mexico 87004	none given	Patricia Pettit	10	1- Basic	142	12/21/94
Environmental Educators of NC	R. Haven O'Donnell-- 106 Fairfield Ct. Chapel Hill, NC 26516 Env'l Coms. to: Sheila Jones, Secretary, Wake County Soil and Water, 4001-D Carya Dr., Raleigh, NC 27610	(919) 967-9677 Fax (919) 933-4560 (#s for R. Haven O'Donnell)	Randee Haven O'Donnell/NAAEE Rep.	10	1- Basic	248	7/14/93
The OH Alliance for the Env't	445 King Avenue Columbus, OH 43201	(614) 421-7819 Fax (614) 421-7819	Irene Probasco/Exec. Dir.	2	1- Basic	not sure	9/16/92
OK Assoc. for EE	c/o CEE 104A Industrial Bldg. OK State Univ. Stillwater, OK 74078	(405) 744-7233 Fax (405) 744-7713	Ted Mills/Past Pres. and Board Memb. (alt.) 405-744-7125	10	2- Intermed.	36	4/4/94
EE Assoc. of OR	PO Box 40047 Portland, OR 97240	(503) 937-2129 (w) (503) 741-1604 (h) (503) 937-2032 (f)	Sue Baker	10	1- Basic	138	2/7/92
Pennsylvania Alliance for EE	3701-1 Orchid Place Emmaus, PA 18049-1638	(610) 967-7233 Fax (610) 965-7223	Mike Weilbacher President (alt.) 215-660-0945 215-299-1028 Fax	10	1- Basic	437	7/25/94
TN EE Assoc.	c/o Great Smoky Mtn. Inst. at Tremont Route 1, Box 700 Townsend, TN 37882	(615) 448-6709 Fax (615) 448-9250	Ken Voorhis/Pres.	10	1- Basic	212	9/24/91

TX Assoc. for EE	7032 Creek Bend Dallas, TX 75252	(214) 248-6283	Sally Evans/Pres. (alt.) 214-422-5148 214-424-6893 Fax	10	2-Intermed.	356	7/30/92
UT Society for EE	350 South 400 East #G4 Salt Lake City, UT 84111	(801) 328-1549 Fax (801) 595-1555	Vern Fridley, Jr. Executive Dir.	10	1-Basic	92	11/8/91
VA Assoc. for EE	c/o Dept. of Env. Quality Richmond, VA 23240-0009	(804) 780-1392 **B. Fox's #: (804) 524-5848**	Ann Regn/Newsltr. Chair; or Barry Fox	7	1-Basic	84	12/27/91
Vermont Statewide EE Programs (SWEEP)	c/o VNRC 9 Bailey Ave Montpelier, VT 05602	Barry King: (802) 388-4082 for EC: Sue Clark (802) 656-4055	Jenefer Lingelbach	1	1-Basic	56	10/6/94
EE Assoc. of WA	P.O. Box 4122 Bellingham, WA 98227 (org.'s address--don't put R. Hunter's name on gen. EEAW mail) For EC "Affil. News", call/write R. Hunter: Wash. State Dept. of Ecology, P.O. Box 47600, Olympia, WA 98504-7600	R.H.'s phone (360) 407-6147; Fax: 407-6146	Rhonda Hunter-NAAEE Rep. Kim Freier, Pres.	10	2-Intermed.	468	9/22/92
Western Regional EE Council	4014 Chatham Lane Houston, TX 77027	(713) 520-1936 Fax (713) 520-8008	Josetta Hawthorne Exec. Director (alt.) 713-622-2219	10	1-Basic	53	10/15/91 (submit'd 4/92)
WI Assoc. for EE	7290 County MM Amherst Junction , WI 54407	(715) 346-2796 Fax (715) 346-3624	Meta Reigel Admin. Ass't (10 hrs/week)	10	3 - High	1,100	10/29/91
Wyoming Assoc. for EE	2820 HWY 120 Cody, WY 82414	(307) 527-7126 Fax: (307) 587-5430	Dennie Hammer President	8	1 - Basic	62	6/28/94

Global Associates: Australian Assoc. for EE, Hungarian Society for EE, Chinese Society for Environmental Education (Taiwan, Republic of China)

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Manager, Technology Transfer
Tennessee Valley Authority

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Gus Medina
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Jerry McCarthy, MT EE Association
Gina Morrison, MT Project WET
Mary Sexton, Pine Butte Swamp, The Nature Conservancy
Donna Sitz, Sitz Ranch/MT Stockgrowers
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Richard Jehle, Yellowstone National Park

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Ted Mills, Photography Exhibit and Contest
Lynn Lomax, Film and Video Festival
Karen Jones, Film and Video Festival
Shann Weston, Environmental Auction
Lisa Knauf, Share Fair
Rocky Rohwedder, EcoNet Demonstration
Andy Alm, EcoNet Demonstration

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Esther Marko
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Josetta Hawthorne
Executive Director, WREEC

MT EE Assoc. Representatives:
Kari Gunderson, President MEEA
and Jerry McCarthy, Past-President, MEEA

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Northern Illinois University's Lorado Taft Field Campus
University of Lethbridge's Faculty of Education
Tennessee Valley Authority's Environmental Education Dept.
Montana Dept. of Fish, Wildlife and Parks

NAAEE Board of Directors:
Elaine Andrews, Univ. of Wisconsin Extension
John Baldwin, NAAEE Pres.; Univ of Oregon
Kathleen Blanchard, Quebec-Labrador Foundation/Atlantic Center for the Environment
Judy Braus, NAAEE ESES Chair, World Wildlife Fund
Randy Champeau, Univ. of Wisconsin-Stevens Point
Peter Blaze Corcoran, Bates College
Claudine Daniel, Wichita National Wildlife Refuge
Carol Fialkowski, Chicago Academy of Sciences
Ken Frazier, Des Moines Community College
Ron Gardella, Northern Kentucky University
Edgar González Guadiano, National Institute for Ecology (SEDESOL)
Paul E. Hart, Univ. of Regina
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Pam J. Puntenney, Environmental Human System Management
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Peggy M. Zemach, Museum of Natural History of Denver

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Teton Science School
University of Alaska-Anchorage/Wilderness Studies
University of Alaska-Anchorage/Alaska Outdoor Education Conference
The World Bank
YIPPEE International
Sara Zavala Translations

The North American Association for Environmental Education

NAAEE is a network of professionals and students working in the field of environmental education throughout North America and in over 40 countries around the world. For more than 20 years, the Association has promoted environmental education and supported the work of environmental educators.

There are many environmental interest groups, and many organizations dedicated to the improvement of education. NAAEE uniquely combines and integrates both of these perspectives, and takes a cooperative, nonconfrontational approach to promoting education about environmental issues.

The Association is made up of people who have thought seriously--over lifetimes--about how people become literate concerning environmental issues. NAAEE members believe education must go beyond consciousness-raising about these issues. It must prepare people to think together about the difficult decisions they have to make concerning environmental stewardship, and to work together to improve, and try to solve, environmental problems.

NAAEE recognizes the need for a coherent body of information about environmental issues. Its members also recognize that information and analysis are only part of an effective education program. To be truly effective, this body of knowledge must be integrated into all aspects of the curriculum and into all types of educating institutions for the widest array of audiences.

In order to translate theory into reality, and provide tangible support for environmental education and environmental educators, NAAEE engages in a variety of programs and activities. Some examples are the annual conference at varying North American sites, an active publications program, the Environmental Education Training Institute, the VINE (Volunteer-led Investigations of Neighborhood Ecology) Network, the Environmental Issues Forums (EIF) program, and the NAAEE Skills Bank.